Summer Chum Salmon Conservation Initiative

An Implementation Plan to Recover Summer Chum in the Hood Canal and Strait of Juan de Fuca Region

Supplemental Report No. 3

Annual Report for the 2000 Summer Chum Salmon Return to the Hood Canal and Strait of Juan de Fuca Region

Washington Department of Fish and Wildlife
Point No Point Treaty Tribes

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Report Availability

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1 - INTRODUCTION

BACKGROUND

The Washington Department of Fish and Wildlife and Point No Point Treaty Tribes distributed the Summer Chum Salmon Conservation Initiative (SCSCI) in April 2000 (WDFW and PNPTT 2000). The initiative described a plan for the implementation of summer chum salmon recovery in Hood Canal and eastern Strait of Juan de Fuca.

The SCSCI specifies preparation of annual reports that describe the results of plan implementation and assesses compliance with and effectiveness of the plan provisions (section 3.6.2 of SCSCI). This is the first annual report, applicable to the year 2000. The topics addressed include stock assessment, harvest management, artificial production, ecological interactions, and habitat, corresponding to the major areas of management activities required to address comprehensive recovery of the summer chum as described in the SCSCI. A concluding remarks section is provided at the end of the report.

2 - STOCK ASSESSMENT

ESCAPEMENT

Spawning ground surveys were conducted throughout the summer chum return period to estimate the abundance of summer chum spawners for all known stocks in the Hood Canal and Strait of Juan de Fuca summer chum region during 1999 and 2000. In addition, the co-managers conducted escapement surveys that will provide information to determine and monitor the status of Dungeness River summer chum salmon, whose status is currently unknown.

Detailed spawning escapement summaries for each stock during 1999 and 2000 are provided in Appendix Report 1. The methods used to estimate escapements are the same as described in SCSCI Appendix Report 1.1, and the information is presented in the same format as in the appendices to Supplemental Report No. 1 of the SCSCI (Haymes 2000). This report includes summaries for the Big Beef, Chimacum, and Dungeness stocks that were absent in the SCSCI.

Summer chum spawning escapement estimates for the period 1968 through 2000 are provided for the Hood Canal and the Strait of Juan de Fuca regions in Appendix Tables 1 and 2, respectively. Information on the number of fish taken for broodstock by each supplementation program is also included.

Escapement estimates for the 1999 and 2000 returns of summer chum salmon are summarized in Table 1, and regional escapement estimates for the period 1974-2000 are presented in Table 2. The following are brief discussions of the 1999 and 2000 summer chum salmon escapements.

Table 1. Regional summer chum salmon escapements during the 1999 and 2000 return years.

Stock/stream	1999	2000
Hood Canal Region		
Big Beef Creek	4	20
Anderson Creek	0	0
Dewatto River	2	10
Tahuya River	1	2
Union River	159	744
Lilliwaup Creek	13	22
Hamma Hamma River	255	229
Duckabush River	92	464
Dosewallips River	351	1,260
Big Quilcene River	3,153	5,630
Little Quilcene River	84	268
Hood Canal Region Total	**4,114**	**8,649**
Strait of Juan de Fuca Region		
Chimacum Crfeek	38	52
Snow Creek	29	30
Salmon Creek	499	846
Jimmycomelately Creek	7	55
Strait of Juan de Fuca Region Total	**573**	**983**

Table 2. Escapement for Hood Canal and the Strait of Juan de Fuca summer chum salmon stocks (1974-2000).

Return Year	Hood Canal Escapement	Strait of Juan de Fuca Escapement	HC/SJF Combined
1974	12,281	1,768	14,049
1975	18,248	1,448	19,696
1976	27,715	1,494	29,209
1977	10,711	1,644	12,355
1978	19,710	3,080	22,790
1979	6,554	761	7,315
1980	3,777	5,109	8,886
1981	2,374	884	3,258
1982	2,623	2,751	5,374
1983	899	1,139	2,038
1984	1,414	1,579	2,993
1985	1,109	232	1,341
1986	2,552	1,087	3,639
1987	757	1,991	2,748
1988	2,967	3,690	6,657
1989	598	388	986
1990	429	341	770
1991	747	309	1,056
1992	2,377	1,070	3,447
1993	756	573	1,329
1994	2,429	178	2,607
1995	9,461	839	10,300
1996	20,490	1,084	21,574
1997	8,972	962	9,934
1998	3,985	1,269	5,254
1999	4,114	573	4,687
2000	8,649	983	9,612

1999 ESCAPEMENTS

The estimated spawning escapement of summer chum to Hood Canal streams in 1999 was 4,114 fish, slightly higher than the 1998 total. The majority of escapement occurred in the major streams entering the west side of Hood Canal. The Big Quilcene River again experienced a good spawning run (3,153 fish). As in 1996, 1997, and 1998, this return originated from fish produced both naturally and by enhancement efforts, and it is assumed that a significant portion of the spawners were progeny of the artificial enhancement program. The Little Quilcene total of 84 spawners was low. The Dosewallips, Duckabush, and Hamma Hamma rivers were roughly equivalent to the 1998 escapements; the 1999 escapements were 351, 92, and 255 fish, respectively. Lilliwaup Creek continued to be very weak, with only 13 summer chum returning to spawn in 1999. The eastern Hood Canal streams again

showed no evidence of any significant returns. However, 2 were observed in the Dewatto River. The Union River escapement was relatively poor in 1999 (159 fish).

In the Strait of Juan De Fuca, Salmon Creek experienced a fairly good escapement of 573 fish in 1999 (progeny of natural spawning and an on-going enhancement program), but Snow Creek and Jimmycomelately escapements were again poor (29 and 7 fish, respectively). Chimacum Creek experienced the first summer chum return in years (the result of its reintroduction project) with an escapement of 38 fish in 1999. Eleven surveys were conducted on the lower Dungeness River between Aug. 9 and Oct. 20, 1999, mostly between R.M. 0.0 to 3.3 ; two live and one dead chum salmon were observed during the October surveys (not shown in Table 1).

2000 ESCAPEMENTS

The estimated spawning escapement of summer chum to Hood Canal streams in 2000 was 8,649 fish. Again, the majority of escapement occurred in the major streams entering the west side of Hood Canal. The Big Quilcene River experienced a good escapement (5,630 fish). As in the previous four years (1996-1999), this return originated from a mix of natural and enhancement program produced fish, and it is assumed that artificial enhancement fish continue to make up a significant portion of the returning spawners. The Little Quilcene River escapement increased this year (268 fish). The Dosewallips, Duckabush, and Hamma Hamma rivers had fair to good spawner abundance in 2000 (1,260, 464, and 229 fish, respectively). Lilliwaup Creek escapement continued to be weak, with 22 fish. The eastern Hood Canal streams again showed no significant escapements, except for improved returns from the Big Beef Creek experimental reintroduction project (20 fish). Also, ten summer chum were observed in the Dewatto (contributing to a 30 fish total over the last 4 years), suggesting that some natural re-colonization may be occurring. The Union River's escapement was good in 2000 (744 fish), reversing a downward trend observed in recent years.

In the Strait of Juan de Fuca for 2000, Salmon Creek experienced an escapement of 983 fish (progeny of natural spawning and an on-going enhancement program), but the Snow Creek and Jimmycomelately escapements were again poor (30 and 55 fish, respectively). Escapement to Chimacum Creek was 52 fish. Ten surveys were conducted on the lower Dungeness River between Aug. 4 and Oct. 9, 2000, mostly between R.M. 0.0 to 3.3; and only one live chum was observed in October (not shown in Table 1).

RUNSIZE

To determine the total numbers of salmon returning to specific production areas, fish that are harvested in mixed stock and terminal fisheries must be allocated to the streams from which they originated. This allocation is done through a post-season process called "run re-construction," which splits the harvests in each catch area into the numbers of fish that were likely contributed by the individual stocks or

management unit thought to be transiting the area. All estimated harvests for each stock or management unit are added to the escapement for that grouping to derive the estimated total return for each year. The run re-construction tables for the years 1991 through 2000 are presented in Appendix Report 2, and a discussion of the run re-construction methodology and results for years prior to 1991 can be found in the SCSCI Appendix Report 1.3.

1999 Runsizes

The estimated 1999 summer chum runsize in Hood Canal was 4,526 fish, with 4,493 fish entering the terminal area (Table 3). The Strait of Juan de Fuca returns in 1999 totaled 577 summer chum salmon, 573 of which entered the terminal area. The combined summer chum return to the Hood Canal/Strait of Juan de Fuca region was 5,103 fish during the 1999 season (Table 4).

2000 Runsizes

For the year 2000 returns, the summer chum runsize in Hood Canal was 9,389 fish, with 9,356 summer chum entering the terminal area (Table 3). The returns of Strait of Juan de Fuca summer chum totaled 986 fish in 2000, with a terminal area runsize of 983 fish. The Hood Canal/Strait of Juan de Fuca region had a combined summer chum total runsize of 10,375 fish during the 2000 return year (Table 4).

Table 3. Regional summer chum salmon runsizes during the 1999 and 2000 return years.

Runsize category	1999	2000
Hood Canal Region		
Escapement	4,144	8,649
Terminal runsize	4,493	9,356
Hood Canal total runsize	4,526	9,389
Strait of Juan de Fuca Region		
Escapement	573	983
Terminal runsize	573	983
Strait of Juan de Fuca total runsize	577	986

Table 4. Total runsizes for Hood Canal and the Strait of Juan de Fuca summer chum salmon stocks (1974-2000). Numbers in **bold** represent new or corrected values.

Return Year	Hood Canal Runsize	Strait of Juan de Fuca Runsize	HC/SJF Combined
1974	14,808	1,985	16,793
1975	29,112	1,728	30,840
1976	74,218	1,673	75,891
1977	16,679	1,810	18,489
1978	25,336	3,240	28,576
1979	9,513	900	10,413
1980	13,018	5,574	18,592
1981	5,857	1,140	6,997
1982	8,302	3,543	11,845
1983	3,500	1,218	4,718
1984	3,365	1,708	5,073
1985	4,411	412	4,823
1986	7,832	1,217	9,049
1987	3,965	2,181	6,146
1988	5,696	4,128	9,824
1989	4,472	795	5,267
1990	1,556	529	2,085
1991	**2,181**	425	**2,606**
1992	3,375	1,394	4,769
1993	**871**	**643**	**1,514**
1994	**2,957**	214	**3,171**
1995	9,977	882	10,859
1996	**21,046**	1,106	**22,152**
1997	**9,373**	985	**10,358**
1998	**4,274**	**1,316**	**5,590**
1999	**4,526**	**577**	**5,103**
2000	**9,389**	**986**	**10,375**

MARK RECOVERY

Supplementation program summer chum fry are differentially marked to allow for distinction from natural-origin fish upon return as adults in fisheries, at hatchery racks, and on the spawning grounds. For the supplementation program on Big Quilcene River, all fry have been adipose-fin-clipped beginning with brood year 1997. For all other supplementation programs, the otoliths of summer chum salmon embryos are thermally mass-marked prior to release. Examination of otoliths recovered from spawned adults and/or for presence/absence of adipose fins provides a method to separate the number of supplementation (hatchery) fish from the number of naturally spawning fish and assists in determining the contribution of the supplementation program to the summer chum population. In addition, adipose-fin-clipping and otolith-marking makes it possible to determine the level of straying of supplementation program-origin fish to other drainages.

The genetic, otolith, and scale collections made from summer chum salmon in eastern Strait of Juan de Fuca and Hood Canal streams during 1999 and 2000 are shown in Tables 5 and 6.

Table 5. Genetic, otolith, and scale collections made from summer chum salmon in eastern Strait of Juan de Fuca and Hood Canal streams, 1999.

Stream	WRIA	GSI Code	Sample size				
			Allozyme	DNA	Otoliths	Scales	Collection method
Jimmycomelately Cr.[1]	17.0285	99 EM	6	6	7	6	Trap, spawner survey
Salmon Cr. [1]	17.0245	---	0	0	177	177	Trap, spawner survey
Snow Cr.	17.0219	99 ER	2	2	2	2	Spawner survey
Chimacum Cr. [1]	17.0203	---	0	0	0	14	Spawner survey
Little Quilcene R.	17.0076	99 EU	32	32	35	35	Spawner survey
Big Quilcene R.	17.0012	---	0	0	0	46	Spawner survey
Dosewallips R.	16.0442	99 GR	0	21	0	53	Spawner survey
Duckabush R.	16.0351	99 GQ	0	1	0	4	Spawner survey
Hamma Hamma R [1]	16.0251	99 EL	45	45	0	45	Seine
Lilliwaup R.[1]	16.0230	99 EE	8	8	0	8	Trap
Union R.	15.0503	---	0	0	0	17	Spawner survey
Totals			**93**	**115**	**221**	**407**	

[1]Stream has supplementation or rehabilitation program.

Table 6. Genetic, otolith, and scale collections made from summer chum salmon in eastern Strait of Juan de Fuca and Hood Canal streams, 2000.

Stream	WRIA	GSI Code	Sample size				
			Allozyme	DNA	Otoliths	Scales	Collection method
Jimmycomelately Cr. [1]	17.0285	00GF	34	45	55	55	Trap, spawner survey
Salmon Cr. [1]	17.0245	00GD	0	147	184	184	Trap, spawner survey
Snow Cr.	17.0219	00GG	0	1	3	5	Spawner survey
Chimacum Cr. [1]	17.0203	00GE	0	32	36	37	Spawner survey
Little Quilcene R.	17.0076	00GC	0	30	21	80	Spawner survey
Big Quilcene R.[1]	17.001	00NU	0	30	42	42	Spawner survey
	17.0012	- - -	0	0	0	395	Seine in bay, rack
Dosewallips R.	16.0442	00GA	0	24	0	121	Spawner survey
Duckabush R.	16.0351	00GB	0	18	0	71	Spawner survey
Hamma Hamma R. [1]	16.0251	00EI	56	56	52	59	Seine, spawner survey
Lilliwaup R.[1]	16.0230	00EJ	13	12	6	13	Trap
Big Beef Cr.[1]	15.0389	00FM	18	18	0	20	Trap
Union R.[1]	15.0503	00EF	81	81	0	81	Trap, spawner survey
Totals			**201**	**494**	**399**	**1,160**	

[1] Stream has supplementation or rehabilitation program.

A report prepared by staff of WDFW's Fish Program Otolith Laboratory describes the results of examining otoliths from adult summer chum salmon collected in Salmon, Snow and Jimmycomelately creeks, and Little Quilcene River during 1999 (Grimm et al. 2000). Table 7 shows these results. Of the 173 otoliths read from adults sampled in Salmon Creek, 75% of age 3 adults and 73% of age 4

adults were otolith-marked. Of two adults sampled in Snow Creek, one was otolith-marked with marks applied at Salmon Creek. Salmon Creek and Snow Creek summer chum are considered the same stock, and it appears that supplementation-origin fish from Salmon Creek are re-colonizing Snow Creek. In Jimmycomelately Creek, none of six adults sampled were otolith-marked. In a sample of 34 adults from the Little Quilcene River, five age 3 adults and one age 4 adult were identified with otolith-marks from Salmon Creek, suggesting that some level of straying of Salmon Creek supplementation program adults has occurred into Little Quilcene River. Analysis is pending for otoliths collected from summer chum adults during 2000.

Table 7. Summary of otoliths examined for marks from adult summer chum salmon sampled at Salmon, Snow, and Jimmycomelately (JCL) creeks and Little Quilcene River, 1999.

Stream	Return year	Age	No. of otoliths examined	No. of otolith marks observed	Otolith marks %
Salmon Cr.	1999	2	0	0	0.0
		3	101	76	75.2
		4	70	51	72.9
		5	2	0	0.0
Snow Cr.	1999	2	0	0	0.0
		3	1	0	0.0
		4	1	1	100.0
		5	0	0	0.0
JCL Cr.	1999	2	0	0	0.0
		3	0	0	0.0
		4	6	0	0.0
		5	0	0	0.0
Little Quilcene R.	1999	2	0	0	0.0
		3	22	5	22.7
		4	12	1	8.3
		5	0	0	0.0

Summer chum adults sampled from all streams during 2000 were examined for adipose-clips to determine the number of adults returning from fry released by the BY 1997 Big Quilcene supplementation program. Two of four age 3 summer chum adults sampled in the Big Quilcene River and 27 of 44 age 3 adults sampled at QNFH were adipose-fin-clipped. In addition, adipose-fin-clipped adults were sampled in Little Quilcene River, Dosewallips River, Duckabush River, and Hamma Hamma River. However, because of low sample sizes it is not possible to determine specific stray rates. The recovery of very small numbers of marked fish (# 3 per stream) indicates that some level of straying of Big Quilcene River supplementation program adults has occurred into other Hood Canal streams.

GENETIC STOCK IDENTIFICATION (GSI)

During 1999 and 2000, the co-managers continued GSI allozyme and DNA collections of summer chum spawners throughout the region (Tables 5 and 6). This will allow us to compare recent and past allozyme collections with the intent to monitor changes in allelic characteristics and to assess whether the supplementation programs have negatively affected the genetic diversity of natural populations. DNA samples were archived for future analysis. Recent allozyme samples have not yet been analyzed.

BIOLOGICAL DATA (AGE, SIZE, AND SEX DATA)

The scale collections made from summer chum salmon in eastern Strait of Juan de Fuca and Hood Canal streams during 1999 and 2000 are shown in Tables 5 and 6. Age composition determined from the scale collections are presented in Table 8 for 1999 and Table 9 for 2000.

Information is also available on the size (fork length) and sex ratio for each stock each year, but it has not been summarized.

Table 8. Age composition for summer chum salmon from eastern Strait of Juan de Fuca and Hood Canal streams, 1999.

Stream	WRIA	GSI Code	No. of scale samples	Age composition from scale samples									Collection Method
				Age 2		Age 3		Age 4		Age 5		Total	
				No.	%	No.	%	No.	%	No.	%	aged[2]	
Jimmycomelately Cr.[1]	17.0285	99 EM	6	0	0.0	0	0.0	6	100.0	0	0.0	6	Trap, spawner survey
Salmon Cr.[1]	14.0245	—	177	0	0.0	103	58.2	72	40.7	0	1.1	177	Trap, spawner survey
Snow Cr.	17.0203	—	14	0	0.0	12	100.0	0	0.0	0	0.0	12	Spawner survey
Chimacum Cr.[1]	17.0076	99 EU	35	0	0.0	23	65.7	12	34.3	0	0.0	35	Spawner survey
Little Quilcene R.	17.0012	—	46	0	0.0	17	40.5	25	59.5	0	0.0	42	Spawner survey
Big Quilcene R	16.0442	99 GR	53	0	0.0	21	44.7	25	53.2	1	2.1	47	Spawner survey
Dosewallips R.	16.0351	99 GQ	4	0	0.0	1	25.0	3	75.0	0	0.0	4	Spawner survey
Duckabush R.	16.0251	99 EL	45	0	0.0	21	48.8	22	51.2	0	0.0	43	Spawner survey
Hamma Hamma R. [1]	16.0230	99 EE	8	0	0.0	3	37.5	5	62.5	0	0.0	8	Spawner survey
Lilliwaup R.[1]	15.0503	—	17	0	0.0	2	11.8	15	88.2	0	0.0	17	Seine, spawner survey
Union R. [1]													Trap Spawner survey

[1] Stream has supplementation or rehabilitation program.
[2] Difference between "No. of scale samples" and "Total no. aged" is number of unreadable or regenerated scale samples.

Table 9. Age composition for summer chum salmon from eastern Strait of Juan de Fuca and Hood Canal streams, 2000.

Stream	WRIA	GSI Code	No. of scale samples	Age composition from scale samples									Collection Method
				Age 2		Age 3		Age 4		Age 5		Total	
				No.	%	No.	%	No.	%	No.	%	aged[2]	
Jimmycomelately	17.0285	00 GF	55	29	52.7	25	45.5	1	1.8	0	0.0	55	Trap, spawner
Cr.[1]	14.0245	00 GD	184	11	6.0	118	64.5	53	29.0	1	0.5	183	survey
Salmon Cr.[1]	17.0219	00 GG	5	0	0.0	2	50.0	2	50.0	0	0.0	4	Trap, spawner
Snow Cr.	17.0203	00 GE	37	4	11.4	18	51.4	13	37.1	0	0.0	35	survey
Chimacum Cr.[1]	17.0076	00 GC	80	1	1.3	4	5.1	73	93.6	0	0.0	78	Spawner survey
Little Quilcene R.	17.0012	00 NU	42	0	0.0	5	12.2	36	87.8	0	0.0	41	Spawner survey
Big Quilcene R		—	395	0	0.0	44	11.1	351	88.9	0	0.0	395	Spawner survey
	16.0442	00 GA	121	0	0.0	4	3.4	114	96.6	0	0.0	118	Spawner survey
Dosewallips R.	16.0351	00 GB	70	0	0.0	11	15.7	57	81.4	2	2.9	70	Seine in bay, rack
Duckabush R.	16.0251	00 EI	59	2	3.4	13	22.4	43	74.1	0	0.0	58	Spawner survey
Hamma Hamma R. [1]	16.0230	00 EJ	13	1	8.3	4	33.3	7	58.3	0	0.0	12	Spawner survey
Lilliwaup R.[1]	15.0389	00 FM	20	2	11.1	14	77.8	2	11.1	0	0.0	18	Seine, spawner
Big Beef Cr. [1]	15.0503	00 EF	81	1	1.2	71	87.7	9	11.1	0	0.0	81	survey
Union R. [1]													Trap
													Trap
													Trap, Spawner survey

[1] Stream has supplementation or rehabilitation program.
[2] Difference between "No. of scale samples" and "Total no. aged" is number of unreadable or regenerated scale samples.

PRODUCTIVITY

Productivity is a measurement of the number of adult chum salmon that are ultimately produced by each year's spawning escapement. Since the summer chum salmon from a given year's spawner population (brood year) return as age 3-, 4- , and 5-year old fish, it is necessary to have reliable age composition data for each annual return. The total returns for each brood year are divided by the number of parent spawners to arrive at the brood year production rate.; typically expressed as recruits per spawner.

There is currently insufficient age composition information for estimating the productivity of summer chum salmon, either on an individual stock or region-wide basis. Age data are now being collected for each management unit from spawned out chum on the spawning grounds and from adults used as brood stock in supplementation programs (Tables 8 and 9). Over time as sufficient data is collected, it can be used to develop estimates of age-specific returns and lead to improvement of productivity estimates for each management unit. The co-managers are committed to collecting this information, but may need additional funding to assemble an adequate age data base

EXTINCTION RISK UPDATE

The extinction risk faced by individual summer chum stocks is assessed annually based on the methodology proposed by Allendorf et al. (1997), and discussed in sect. 1.7.4 of SCSCI. The Allendorf et al. (1997) methodology consists of a set of procedures for rating extinction risk and for providing an estimation of the possible consequences of extinction for Pacific salmon stocks. The methods for estimating extinction risk use either population viability analysis (PVA) or a set of surrogate measures that include current population size parameters and population trends.

The methods used to assess extinction risk result in the ranking of individual stocks into one of four categories; very high, high, moderate, and special concern (see SCSCI Table 1.11). For the purposes of this assessment, a "low" category was added for defining stocks that did not fit any of the above categories and are not at risk of extinction. Table 10 below presents the up-dated extinction risk assessments for summer chum stocks based on the 1997 through 2000 return year escapements (Appendix Tables 1 and 2). Short discussions for each stock follow.

Table 10. Extinction risk assessment for summer chum salmon based on escapements for the 1997 through 2000 return years (method from Allendorf et al. 1997).

Stock	Escapement (mean 97-00)	Effective Population Size (N_e) [1]	Total Population Size (N) [2]	Recent Population Trend	Risk Rating
Union	384	276	1,382	Increasing	Moderate
Lilliwaup	22	16	78	Chronic decline or depression	High
Hamma Hamma	175	126	630	Increasing	Moderate
Duckabush	314	226	1,131	Increasing	Moderate
Dosewallips	499	359	1,795	Increasing	Moderate
Big & Little Quilcene					
Current status	5,024	3,617	18,086	Increasing	Low
Pre-project status	89[3]	64	320	Precipitous decline	High
Snow/Salmon					
Current status	869	626	3,128	Increasing	Low
Pre-project status	226[4]	163	814	Precipitous decline	High
Jimmycomelately	55	40	199	Precipitous decline	Very high
Dungeness	No data	Not available	Not available	Not available	Special concern

[1] Effective population size (N_e) = Average escapement x 3.6 (generation length) x 0,2 ($N_e \div N$).
[2] Total population size (N) = Average escapement x 3.6 (generation length).
[3] Big/Little Quilcene average escapement for 1988 through 1991 return years.
[4] Snow/Salmon creeks average escapement for 1989 through 1991 return years (see text).

UNION RIVER

Estimated escapements to the Union River show no declining trend over the period of record and, in fact, appear to have increased somewhat since the 1970s. Escapements over the last four years have ranged from 159 to 744, averaging 384 spawners. This stock meets only one high risk criterion (population size, $N < 2{,}500$), and the risk of extinction is rated as moderate.

LILLIWAUP CREEK

Estimated escapements to Lilliwaup Creek range from 13 to 28 over the last four years, averaging only 22 spawners. The effective population size *(N_e)* equals only 16 fish for the 1997-00 return years, and total population size *(N)* is 78 for the same years. Because the population meets one very high risk

criterion (low population size, N_e < 50 or N < 250) and is in a chronic decline situation, the risk of extinction is judged to be high.

HAMMA HAMMA RIVER

The annual average estimated Hamma Hamma system escapement over the past four years is 175, ranging from 104 to 259 spawners. The effective population size *(N_e)* equals 126 fish for the 1997-00 return years, and total population size *(N)* is 630 for the same years. Because the population meets one high risk criterion (population size, N_e < 500 or N < 2,500) and is currently increasing relative to the low years from 1987-1993, the risk of extinction is judged to be moderate.

DUCKABUSH RIVER

The estimated escapement in the Duckabush River ranges from 92 to 464 over the last four years, averaging 314 spawners. The effective population size *(N_e)* equals 226 fish for the 1997-00 return years, and total population size *(N)* is 1,131 for the same years. Though escapements have declined substantially since the 1970s, the current escapement levels are higher than the low levels experienced from 1984 through 1990. The recent population size for this stock *(N_e* < 500 or N < 2,500) indicates that the risk of extinction for Duckabush summer chum is moderate.

DOSEWALLIPS RIVER

The 1997 through 2000 annual average escapement was 499 spawners, ranging from 47 to 1,260. The effective population size *(N_e)* equals 359 fish for the 1997-00 return years, and total population size *(N)* is 1,795 for the same years. Escapements have increased substantially over the lows experienced in the 1980s, however, the recent population size for this stock *(N_e* < 500 or N < 2,500) indicates that the risk of extinction for Dosewallips summer chum is moderate.

BIG/LITTLE QUILCENE RIVERS

Escapement estimates averaged 5,024 spawners (range of 3,057 to 7,903) for the Big/Little Quilcene summer chum stock for the 1997 through 2000 return years. The combined (including broodstock removals) total effective population size *(N_e)* equals 3,617 fish for the 1997-00 return years, and the total population size *(N)* is 18,086 for the same years. These recent returns likely were affected by the existing supplementation project begun in 1992. Based on an increasing escapement trend and the large recent escapements, the current extinction risk for this stock is low.

SNOW / SALMON CREEKS

From 1997 through 2000, escapement estimates averaged 869 spawners (range of 528 to 1,171) for the Snow/Salmon stock. The effective population size *(N_e)* equals 626 fish for the 1997-00 return years, and total population size *(N)* is 3,128 for the same years. The recent return estimates were affected by returns to the existing supplementation project begun on Salmon Creek in 1992. Since the stock (with two streams combined) has experienced increasing overall escapements in recent years and average escapement exceeds the population size risk criteria, the current risk of extinction is judged to be low.

JIMMYCOMELATELY CREEK

Escapements for Jimmycomelately Creek for the past four years annually averaged 55 spawners (range of 7 to 98). The effective population size *(N_e)* equals 40 fish for the 1997-00 return years, and total population size *(N)* is 199 for the same years. Because of the precipitous decline of this stock and population sizes meeting the very high risk criteria ($N_e < 50$ or $N < 250$), the risk of extinction is judged to be very high.

DUNGENESS RIVER

Summer chum spawner information comes from observations made in the course of collecting data on chinook and pink salmon as part of ongoing stock assessment and recovery efforts for these two species. More detailed information is needed before extinction risk can be evaluated and, in the interim, the Dungeness River stock risk is rated to be of special concern.

ADDRESSING STOCK ASSESSMENT INFORMATION NEEDS

As noted in section 3.5.12 of the SCSCI, success of the implementation plan is dependent on application of the best current data and data analysis to the management of the summer chum salmon resource. Several stock assessment information needs identified in section 3.5.12 have been addressed by the co-managers during 1999 and 2000, including the following.

- The frequency of escapement surveys has been improved as surveys are conducted on a weekly basis; this will contribute to better escapement estimates.

- Age composition information is being collected for each management unit from spawned out chum on the spawning grounds; over time as sufficient data is collected, it can be used to develop estimates of age-specific returns and lead to improvement of productivity estimates for each management unit.

- Stray rates and contribution of supplementation-origin adults to natural spawning escapement is being determined through marking programs and sampling for marks on the spawning grounds of more streams than in the past; however, additional funding is needed to expand escapement surveys for mark sampling.

3 - HARVEST MANAGEMENT

The following section summarizes the harvest management actions, and results of those actions, relative to summer chum salmon, in the year 2000. The year 2000 is the first year in which the Base Conservation Regime (BCR) was implemented and the results can generally be described as very good. Table 11 provides an overview of the preseason estimates which triggered the various management responses, as well as the post-season estimates of results. It should be noted however that some of the information presented is preliminary and subject to revision, once commercial catch data are verified and recreational catch data are included. Table 12 shows summer chum salmon harvest by management unit and fishery, and Table 13 provides an overview of exploitation rates, relative to the BCR targets, for 1999 and 2000.

Table 11. Post-season assessment of forecasts, recruitment, and escapement by summer chum salmon harvest management unit in the year 2000.

Management Category	Sequim	Discovery	Quilcene	Mainstem Hood Canal	SE Hood Canal
Preseason Recruit Forecast	82	710	3,945	2,601	442
Postseason Recruit Estimate [1]	55	879	6,628	2,012	749
Forecast Error	49.1%	-19.2%	-40.5%	29.3%	-41.0%
Expected Escapements [2]	50	802	4,157	1,793	655
Est. Escapement	55	876	5,898	2,005	746
Escapement Target Exceedance	9.6%	9.3%	41.9%	11.8%	14.0%
Estimated Exploitation Rate [1]	0.0%	0.3%	11.0	0.3%	0.4%

[1] Post season recruit estimates are preliminary and will be revised upwards when recreational harvest estimates are added.

[2] Expected escapements are generally those that would result from application of BCR expected exploitation rates. In the case of Quilcene, it was assumed that up to 50% of the entry after mid-September could have been considered "harvestable".

Table 12. Summer chum salmon harvest, by management unit and fishery.[1]

Fishery	Sequim	Discovery	Quilcene	Mainstem Hood Canal	SE Hood Canal
Canada	0	2	17	5	2
U.S. Mixed	0	1	6	2	1
Terminal	0	0	0	0	0
Extreme Terminal	0	0	707	0	0

[1] Post season harvest estimates are preliminary and will be revised upwards when recreational harvest estimates are added.

Table 13. Post season assessment of exploitation rates for 1999 and 2000, relative to BCR target levels.

	Exploitation Rates		
Management Unit	BCR Target	1999 Est.	2000 Est.[1]
Sequim	8.8%	0.0%	0.0%
Discovery	8.8%	0.8%	0.3%
Chimacum	n/a	0.0%	0.0%
Quilcene	15.2%	8.9%	11.0%
Mainstem HC	10.9%	7.8%	0.3%
Southeast HC	12.6%	8.0%	0.4%

[1] Based on preliminary harvest data; recreational catch not included.

PRESEASON ESTIMATES AND PLANNING

Preseason forecasts for 2000 indicated that the Sequim, Discovery and Mainstem Hood Canal management units' (MU) abundance would fall short of the critical threshold, to varying degrees. The preseason forecasts are presented in the Hood Canal and Strait of Juan de Fuca Framework Management Plans (PNPTC and WDFW 2000, and PNPTC, WDFW, Makah Tribe 2000). There was no preseason testing for "flags" relative to individual populations within the Mainstem Hood Canal MU, because the entire MU was already predicted to be below its critical threshold.

Preseason planning by the co-managers, in the PFMC/NOF process, focused on harvest management provisions for U.S. fisheries which were generally adopted in conformity with those found in Tables 3.29 - 3.34 of the SCSCI. Following co-manager consultation and review of fishery proposals, no additional measures were identified to address units predicted to be below the critical threshold. Provisions not implemented in 2000 included the release of chum salmon in Area 4 troll and recreational fisheries, the release of chum salmon in Area 10 recreational fisheries, and release from

treaty Indian seines in Areas 7 and 7A. However, there appears to be no indication, given presently available data, that any significant numbers of summer chum salmon were caught in these fisheries. A detailed description of the adopted measures for terminal areas can be found in the co-managers' joint reports on the 2000 Management Framework Plan and Salmon Runs' Status for each of the two Puget Sound regions concerned. Strait of Juan de Fuca (PNPTC, WDFW, Makah Tribe 2000); and Hood Canal (PNPTC and WDFW 2000). For pre-terminal fishery plans and agreements, a summary can be found in the Summary Fishing Agreements for Treaty and Nontreaty Fisheries in the Ocean, North of Cape Falcon, and in Puget Sound (WDFW and Western Washington Treaty Tribes 2000).

INSEASON AND POST-SEASON ESTIMATES AND MANAGEMENT ACTIONS

Estimated exploitation rates for Canadian fisheries were well below the level of BCR, however it should be noted that the estimated mortality resulted solely from PSC test fisheries. In U.S. mixed stock areas the exploitation was also well below the BCR level. Finally, in terminal areas the exploitation was nil.

Postseason estimates of recruitment indicated an over-prediction for the Sequim and Mainstem Hood Canal MUs, and an underprediction for the Discovery, Quilcene and SE Hood Canal MUs (Table 11). The preliminary postseason estimates of abundance (estimates will increase when recreational harvest estimates become available and are added to the total) indicate that only the Sequim and Mainstem HC MUs were below the critical abundance threshold.

During the season, no changes were made from the initially adopted plans. Using provisions of the BCR, an inseason projection of escapement to the Quilcene MU was made. The projection indicated that escapement would be significantly above the thresholds provided in the SCSCI for fishery modification. However, a decision was made inseason to not increase treaty gillnet fishing days for coho harvest in Area 12A. Instead, provisions were made for coho harvest in the Quilcene River, immediately below the hatchery.

With the exception of the Quilcene MU, where separate management provisions apply, escapement rates varied between the MUs, ranging from 99.6% to 100%. In the Quilcene MU, the escapement rate was 89%. Therefore, fisheries in 2000 did not exacerbate conditions for any of the units whose abundance was below the critical threshold.

INFORMATION SOURCES

Harvest contributions were estimated using the same methods as those used during the preparation of the SCSCI. No additional information became available for use in this task.

Assessment of survival to recruitment, by age was not possible for the return of year 2000, however age at return information is being collected and analyzed for this purpose (see Biological Data sub-section above in Stock Assessment section).

Escapement monitoring met or exceeded the requirements of SCSCI. Quality of data used to estimated escapements was judged good in all cases (see Appendix Report 1).

Harvest information was based on a number of sources. For Canadian fisheries, catches were reported by PSC (Pieter VanWill- PSC, personal communication to Nick Lampsakis). For pre-terminal and terminal US fisheries, the co-managers relied of fish ticket data. For US recreational fisheries, the co-managers will be relying on catch record expanded information, when it becomes available (expected in the fall of 2001).

MONITORING

In addition to catch record data, pre-terminal and terminal area commercial catches were sampled at buying stations, as part of CWT recovery program, and any chum salmon were recorded. In recreational fisheries, sampling was used primarily in Area 5 to estimate encounters (WDFW 2000).

No biological data were collected in fisheries, primarily because of the scarcity of catch and the difficulties involved in setting up biological sampling programs for very small numbers of fish (1-2 fish per stratum).

COMPLIANCE AND ENFORCEMENT

Compliance by the parties was as specified in the SCSCI. All parties adopted regulations in accordance with the preseason plan and SCSCI. Implementation enforcement indicated no significant violations.

In the Strait of Juan de Fuca and Hood Canal terminal and extreme terminal areas where summer chum salmon are likely to be present in significant quantities, additional fishery patrol efforts were directed by the treaty Tribes and WDFW. More specifically, areas covered during the months of August and September, included Dungeness Bay, Sequim Bay, Discovery Bay, Quilcene Bay and River, Area 12C and numerous rivers where summer chum salmon would be present.

Tribal patrol officers placed particular emphasis on contacting tribal fishers, to inform them of the need to release all live chum salmon. An effort was also made to inspect catches, where available, during nearshore fishing operations. No tribal fishery citations relating to summer chum salmon were issued.

WDFW enforcement personnel conducted emphasis patrols on the coho-directed sport fishery in the Big Quilcene River during the 2000 season. Between August 25 and October 9, officers contacted

312 fishers (tribal and non-tribal) and wrote 62 citations. The overall assessment was that this was an orderly fishery, the area closure on the lower river (downstream of Rodgers Street) to protect summer chum worked well, and compliance improved as citations were issued.

4 - ARTIFICIAL PRODUCTION

Artificial production (hatchery) techniques may be used to supplement currently depressed wild summer chum populations or to reintroduce summer chum into streams where the original population no longer exists. When properly implemented, supplementation and reintroduction can be powerful tools which, in combination with harvest and habitat management actions, can contribute to the recovery or restoration of naturally-producing populations. As described in section 3.2 of the SCSCI, the intent of supplementation of summer chum in the Hood Canal Region is to reduce the short term extinction risk to summer chum populations and to increase the likelihood of their recovery.

This section of the annual report is organized to provide background information for six ongoing supplementation and two ongoing reintroduction projects, including a brief history, an overview of project monitoring and evaluation, and a perspective on the Hatchery and Genetic Management Plans prepared for each project. Individual reports are also provided for each project which include more detailed information on annual production and monitoring and evaluation, as well as a general program assessment.

BACKGROUND

HISTORY OF PROJECTS

Consistent with the SCSCI, supplementation has been applied as a strategy to help recover summer chum populations in Hood Canal and the eastern Strait of Juan de Fuca since 1992. Programs initiated in 1992 include Big Quilcene River, Lilliwaup Creek, and Salmon Creek supplementation projects. Re-introduction of summer chum into Chimacum and Big Beef creeks began in 1996; summer chum adults returned to these streams during 1999 and 2000. Supplementation programs were also initiated on Hamma Hamma River in 1997, on Jimmycomelately Creek in 1999, and on Union River in 2000. All of these summer chum recovery programs are on-going. Cooperators participating in the projects include Hood Canal Salmon Enhancement Group (HCSEG), North Olympic Salmon Coalition (NOSC),Wild Olympic Salmon (WOS), Long Live the Kings(LLTK), and the U.S. Fish and Wildlife Service (USFWS).

PROJECT MONITORING AND EVALUATION

Critical objectives of the SCSCI include the monitoring and evaluation of the effects of supplementation on the natural summer chum populations and of the effectiveness of the programs in the recovery of summer chum (see section 3.2.2.4 of the SCSCI). The basic approach is to collect information that will help determine 1) the degree of success of each project; 2) if a project is unsuccessful, why it was unsuccessful; 3) what measures can be implemented to adjust a program that is not meeting objectives for the project; and 4) when to stop a supplementation project.

Each project is to be fully consistent with the intent and implementation of the monitoring and evaluation component for supplementation programs identified in the SCSCI. The recommendations for monitoring and evaluation in the SCSCI respond to concerns regarding the uncertainty of summer chum supplementation and reintroduction effects by addressing the following four elements :

Element 1 - The estimated contribution of supplementation/reintroduction program-origin chum to the natural population during the recovery process;

Element 2 - Changes in the genetic, phenotypic, or ecological characteristics of populations (target and non-target) affected by the supplementation/reintroduction program;

Element 3 - The need and methods for improvement of supplementation/reintroduction activities in order to meet program objectives, or the need to discontinue a program because of failure to meet objectives; and

Element 4 - Determination of when supplementation has succeeded and is no longer necessary for recovery by collection and evaluation of information on adult returns.

The description of monitoring and evaluation activities for each supplementation and reintroduction project are provided below in individual project reports, consistent with the above elements and as more fully described in the SCSCI.

HATCHERY AND GENETIC MANAGEMENT PLANS

The Sustainable Fisheries Division of the National Marine Fisheries Service (NMFS) worked with Pacific Northwest fish management agencies to develop a template for completing Hatchery and Genetic Management Plans (HGMPs) that would provide information necessary for ESA and other hatchery evaluation processes. On a broader scale, NMFS anticipates using the HGMP to evaluate "take" associated with hatchery operations pursuant to recently proposed section 4(d) rules that would allow limitation of take prohibitions for hatcheries with approved HGMPs. An additional important purpose of the HGMPs is the creation of a source for comprehensive hatchery program information for use in regional fish production and management planning by federal, state, and tribal managers.

The HGMP provides a thorough description of each hatchery operation including the facilities used, methods employed to propagate and release fish, measures of performance, status of ESA-listed stocks that may be affected by the program, anticipated listed fish "take" levels, and descriptions of risk minimization measures applied to safeguard listed fish.

During 2000, HGMPs were prepared by WDFW and the U.S. Fish and Wildlife Service (USFWS) and submitted to NMFS for the following summer chum supplementation and reintroduction programs in the eastern Strait of Juan de Fuca and Hood Canal areas.

Supplementation Programs	Reintroduction Programs
Jimmycomelately Creek	Chimacum Creek
Salmon Creek	Big Beef Creek
Quilcene River	
Hamma Hamma River	
Lilliwaup River	
Union River	

A copy of each HGMP is available at NMFS Northwest Region web site at "www.nwr.noaa.gov/".

The HGMPs are now being evaluated by NMFS for their compliance with criteria included in limit 5 of the ESA 4(d) Rule. In addition, information in the HGMPs, the SCSCI, and other sources were used by NMFS in the preparation of a Biological Opinion on the Hood Canal summer chum salmon supplementation and reintroduction programs and artificial propagation programs producing other salmonid species within the Hood Canal summer chum Region boundary. The opinion will serve as a primary reference for future NMFS evaluations and determinations through the 4(d) permitting process.

INDIVIDUAL PROJECT REPORTS

Individual project reports are presented for each supplementation and reintroduction project in the Hood Canal and Strait of Juan de Fuca regions. Appendix Report 3.2 of the SCSCI provides descriptions of the Big Quilcene, Lilliwaup, Hamma Hamma, Big Beef Creek, Salmon Creek, and Chimacum Creek programs, including program objectives, broodstock and production data through brood year 1998, and operating procedures and objectives. Summaries and overviews are provided below for each of these programs which update information in the SCSCI Appendix Report 3.2 through brood years 1999 and 2000. Union River (Hood Canal) and Jimmycomelately Creek (Strait of Juan de Fuca) supplementation programs were initiated after completion of the SCSCI. Therefore, more detailed descriptions of these two projects are included here and, like the SCSCI Appendix Report 3.2, describe program objectives, broodstock and production data, and operating procedures and objectives. Finally, for each project, monitoring and evaluation results are described and a brief general program assessment is provided.

HOOD CANAL REGION

BIG QUILCENE RIVER

A supplementation program was started in 1992, in response to the critical condition of the stock and to take advantage of a year expected to be relatively strong in the Hood Canal summer chum return cycle. The program is operated by the USFWS at the Quilcene National Fish Hatchery (QNFH). To date, over 3,700 summer chum adults have been spawned for supplementation and almost 3 million fry have been released into the Big Quilcene River. It is apparent that the Big Quilcene supplementation project has contributed to increased returns observed for this stock. Since 1996, the Quilcene program has also contributed eggs and fry to support the re-introduction program for summer chum at Big Beef Creek.

ANNUAL PRODUCTION

A summary of the production for each brood year of the project is presented in Table 14.

Table 14. Quilcene National Fish Hatchery summer chum supplementation program data - 1992-2000.

Brood Year	Broodstock Retained			Natural Spawners	Percent Removed	# Fed Fry released	Release Size (gms)	Release Date
	# Males	# Females	Total					
1992	225	186	411	320	56.2	216,441	1.05	4/13/93
1993	19	17	36	97	27.1	24,784	1.46	3/30/94
1994	184	178	362	349	50.9	343,550	1.06	3/27/95
1995	243	256	499	4,029	11.0	441,167	1.06	3/27/96
1996	438	333	771	8,479	8.4	612,598	1.34	4/10/97
1997	296	261	557	7,339	7.1	340,744	1.62	4/2, 4/15/98
1998	313	231	544	2,244	19.5	343,530	1.28	3/8, 3/22, 4/2/99
1999	81	89	170	2,982	5.4	181,711	1.03	3/9, 3/24/00
2000	187	195	382	5,126	6.9	414,353	1.01	3/5, 3/19/01

The condition factor ($K=10,000\times$ weight/length^3) of fry for brood year 2000 was measured on March 5 and 6. For 100 fish measured, mean $K_{\text{total length}} = 0.708$ (std.dev. =0.0709), and mean $K_{\text{fork length}} = 0.801$ (std. dev. = 0.090).

The transfers of summer chum eyed eggs and fry from the Quilcene NFH to Big Beef Creek for brood years 1996 through 2000 are summarized in Table 15.

Table 15. Summer chum transfers from Quilcene NFH to Big Beef Creek.

Brood Year	Fry	Eyed Eggs
1996	40,000	168,000
1997	0	157,000
1998	0	217,465
1999	0	40,298
2000	0	55,500

MONITORING AND EVALUATION

Fish marking, mark recovery and adult returns - Beginning with brood year 1997, (3-year olds returning in 2000) the summer chum fry released at Quilcene NFH were adipose-clipped to identify returning adults as hatchery-origin fish. Sampling results showed an estimated 60.8% of all returning three-year-olds were fin-clipped and therefore were of hatchery origin (see calculation at bottom of Table 16). The mark rate on the 1997 brood release was 91.9%, so the estimated return of hatchery origin age-3 chum in 2000 is 428 adults ([0.1175×5,508]×[0.608÷0.919] = 428). As adults return in subsequent broods, more complete results that define the contribution of supplementation-origin fish will be obtained. Table 17 describes adult returns to the Big Quilcene River by originating brood; the estimates are of combined supplementation-origin and natural-origin fish.

Table 16. Summer chum mark sampling in Big Quilcene system, 2000.

			Observed age from scales		
Source	**Sampled**	**Marks observed**	**Age 3**	**Age 4**	**Undeterminable**
Spawned carcasses in river	42	2	6	35	1
Mortalities recovered in fishery	10	3	3	7	0
Spawned/died at hatchery	392	26	42	341	9
Total	**444**	**31**	**51 (11.75%)**	**383 (88.25%)**	**10**

Note: If 51 of the sampled fish are three-year-olds and 31 marks were observed in the sample, then the estimated rate of marked three-year-olds is 60.8% ([31/51]×100 = 60.8%).

Table 17. Big Quilcene River summer chum salmon brood returns, related to originating brood.

Brood year	Total adults contributing[1]	Hatchery release	Resulting escapement, number at age				Total resulting escapement
			2 yr	3 yr	4 yr	5 yr	
1988	120	0			707	93	800
1989	1	0		24	24	9	57
1990	6	0	0	8	44	0	52
1991	49	0	8	651	189	0	848
1992	732	216,441	7	4,339	8,712	363	13,421
1993	136	24,784	0	365	484	14	863
1994	741	343,550	173	7,015	936	0	8,124
1995	4,520	441,167	35	1,831	1,239	0	3,105
1996	9,189	612,598	7	1,913	4,861		6,781
1997	7,896	340,744	0	647			

[1] Includes natural spawners and hatchery broodstock.

Genetic and age sampling - The co-managers continued GSI allozyme and/or DNA collections of summer chum, including samples from Big Quilcene River during 2000 and Little Quilcene River during 1999 and 2000 (see Tables 5 and 6 in Stock Assessment section). Recent GSI samples have not yet been analyzed. Scales were also sampled to age the fish (see Tables 5, 6, 8, 9 and 17).

Hatchery survival rates - The SCSCI and the HGMP prepared for the Quilcene NFH program establish survival rate objectives during incubation and rearing. The following survival rate objectives for each life stage are applied to all programs; these rates are used as criteria for measuring the effectiveness of each program:

Chum Life Stage	% Survival by Life Stage	Cum. % Survival from Green Egg
Green egg to eye-up	90.0	90.0
Eye-up to Swim-up	99.5	89.5
Swim-up to release	95.0	85.0

During 1999 and 2000, the Quilcene NFH summer chum program was successful in meeting the on-station survival rate objectives. During 1999, survival at the Quilcene facility was 84.4% from green egg to release; 90.0% from green egg to eye-up, 100% from eye-up to swim-up, and 93.8% from swim-up to release. During 2000, survival rates were 85.0% from green egg to release; 92.6% from green egg to eye-up, 99.4% from eye-up to swim-up, and 93.5% from swim-up to release.

Hatchery operations - Records of fish culture activities are regularly maintained and compiled. Information available includes protocols and procedures used; temperature unit records by

developmental stage; ponding, feeding, rearing and release data; production numbers, survival estimates, sizes at release, and recommendations for facility or protocol improvements.

Broodstocking and egg sources - To represent the demographics of the donor population, Quilcene broodstock were collected as the fish arrived in Quilcene Bay and/or at a permanent trap operated by US Fish and Wildlife Service at QNFH.

Since the inception of the supplementation program in 1992, age and length information has been collected from adults processed at the hatchery. No trends in age or length are apparent (see Tables 18 and 19). The high mean ages of source adults in 1992 and 1993 (Table 19) reflect the strength of the 1988 brood year.

Table 18. Mean fork length of adult summer chum to Big Quilcene, hatchery observations applied to total return.

	Mean fork length, mm			
	Source adults		Returning adults	
Source brood	Females	Males	Females	Males
1989			599	634
1990			642	628
1991			639	669
1992	620	659	649	704
1993	624	644	656	687
1994	632	666	621	649
1995	602	641	665	703

Table 19. Mean age of adult summer chum to Big Quilcene, hatchery observations applied to total return.

	Mean age					
Source brood	Source adults			Returning adults		
	Combined	Females	Males	Combined	Females	Males
1989				3.53	4.01	3.25
1990				3.70	4.00	3.63
1991				3.20	3.17	3.22
1992	3.93	3.99	3.88	3.71	3.67	3.73
1993	4.51	4.69	4.35	3.53	3.58	3.49
1994	3.07	3.05	3.09	3.09	3.11	3.07
1995	3.04	3.03	3.05	3.38	3.45	3.33

Fish Health - Fish health was monitored by a USFWS fish health specialist in accordance with procedures in the co-managers' disease control policy. During 1999 and 2000, summer chum broodstock were sampled for the incidence of viral pathogens, there was no significant mortality to unknown causes, and fish health condition of fry prior to release was good. Infectious hematopoietic

necrosis virus (IHNV) was isolated from adult summer chum sampled in 1999, but was not detected in their progeny.

GENERAL PROGRAM ASSESSMENT

High levels of adult returns appear to be associated with the supplementation program. In fact, escapement of the Big/Little Quilcene stock has exceeded the escapement criterion for program reduction. The criterion is that the annual total of hatchery-origin and natural-origin escapement exceed the mean 1974-1978 escapement for four consecutive years (section 3.2.2.b of SCSCI). The Big/Little Quilcene mean escapement for 1974 through 1978 is 2,607 spawners. Table 20 shows annual escapement exceeds that level every year, beginning in 1995, the first year of adult returns from the supplementation project. Discussions are on-going to determine the appropriate scale of future releases from Quilcene NFH.

Table 20. Total escapement to Big and Little Quilcene rivers (natural spawners and hatchery spawned).

Return year	Total escapement
1974	839
1975	2,273
1976	3,533
1977	1,594
1978	4,794
mean 74-78	2,607
1992	743
1993	148
1994	722
1995[1]	4,574
1996	9,515
1997	7,903
1998	3,053
1999	3,237
2000	5,898

[1] First year of returns from supplementation program.

The following outline describes how the Quilcene supplementation project has addressed the program objectives described in section 3.2.3.4 of the SCSCI.

Objective 1: Stabilize or increase the number of summer chum returning.

- The program has been successful in building the returns to stable levels with escapements exceeding 3,000 fish every year since adult returns from supplementation began in 1995 (Table 20).

Objective 2: Boost numbers of naturally produced fish. Procure up to 170 spawning pairs to produce an initial fry release level of 389,000.

- Assessment of naturally produced fish numbers awaits results from the adipose-fin-clipping of all Quilcene supplementation released fry beginning with brood year 1997. The first year of 3 and 4 year old returns occurs in 2001.
- The program has been successful in procuring brood stock and maintaining release levels at target levels in most years (Table 14).

Objective 3: Monitor and evaluate the effectiveness of the supplementation program, as measured by consistency with criteria set forth in section 3.2.2.3 (of SCSCI). Report results of program each year.

- Monitoring and evaluation of the supplementation program is reported above in this Quilcene project report. The program is consistent with the aforementioned supplementation criteria.

Objective 4: Decrease fed fry release levels when combined hatchery and wild-origin returns have exceeded 2,607 adults over four consecutive years.

- The combined hatchery and wild-origin returns have exceeded 2,607 adults for four consecutive years and discussions are now ongoing to determine the appropriate scale of future fed fry releases.

Objective 5: Future consideration will be given to the option of continuing supplementation at a level that will support tribal treaty fishing opportunity.

- There has been no decision to modify the program by the co-managers.

Objective 6: Monitor returns to determine if supplementation is appropriate and warranted in the future.

- Returns are being monitored (see Stock Assessment section for details).

Objective 7: Manage the Little Quilcene as a wild production area.

- There is currently no supplementation program in the Little Quilcene River which is being managed as a wild production area.

Objective 8: Support reintroduction of summer chum into Big Beef Creek.

- Support for Big Beef reintroduction is being provided.

Objective 9: Establish Quilcene stock in Big Beef Creek to reduce risk of extirpation by spreading that risk between two watersheds.

- Support for the establishment of Quilcene stock in Big Beef Creek is being provided.

BIG BEEF CREEK

The Big Beef Creek project began with brood year 1996 when Quilcene stock summer chum eyed eggs were transferred from Quilcene National Fish Hatchery (QNFH) to Big Beef Creek to initiate and support the reintroduction of a summer chum population there.

ANNUAL PRODUCTION

A summary of the production for each brood year of the project is provided in Table 21.

Table 21. Big Beef Creek summer chum reintroduction program, brood years 1996-2000.

Brood year	No. eggs received from QNFH	No. fed fry released	Release size (gm)	Release date
1996	168,000[1]	204,000	0.5-0.7	2/7, 3/7/97
1997	15,7000	100,280	0.8	2/9/98
1998	21,7465	214,936	1.1-1.6	2/23, 3/15, 3/29/99
1999	4,0298	39,800	1.4	3/10/00
2000	81,672[2]	80,550	1.4-1.8	2/26, 3/13/01

[1] Also received 40,000 swim-up fry from QNFH.
[2] Includes 26, 172 eyed eggs from Big Beef Cr. fish and 55,500 eyed eggs from QNFH.

MONITORING AND EVALUATION

Fish marking and mark recovery - Beginning with brood year 1998, the otoliths of summer chum salmon embryos produced in the reintroduction program on Big Beef Creek were thermally mass-marked (otolith-marked) prior to release as fry to distinguish them from other summer chum returning to Big Beef Creek. During 1999 and 2000, a permanent trap was operated throughout the summer chum return to enumerate spawners and to collect information on fish origin and age composition (see Section 2, Stock Assessment). Beginning in 2001, examination of otoliths recovered from spawned adults will provide a method to separate the number of reintroduction (hatchery) fish from the number of naturally spawning (wild) fish and/or strays from other supplementation programs and assists in determining the contribution of the reintroduction program to the summer chum population.

Adult returns - The Big Beef Creek reintroduction program began contributing to the return of adult summer chum during 1999 and 2000, providing the first returns of summer chum to Big Beef Creek since the mid-1980's. An estimated 4 jack (age 2 males) summer chum returned to Big Beef Creek during fall 1999 and 20 summer chum (9 males, 11 females) returned during fall 2000.

Genetic and age sampling - The co-managers continued GSI allozyme and/or DNA collections of summer chum in the Region, including samples from Big Beef Creek during 2000 (see Table 5 in Stock Assessment section). Recent GSI samples have not yet been analyzed. Scales were also sampled to age the fish (Tables 5 and 9).

Hatchery survival rates - The SCSCI and the HGMP prepared for the Big Beef Creek program establish survival rate objectives during incubation and rearing. The following survival rate objectives for each life stage are applied to all programs; these rates are used as criteria for measuring the effectiveness of each program:

Chum Life Stage	% Survival by Life Stage	Cum. % Survival from Green Egg
Green egg to eye-up	90.0	90.0
Eye-up to Swim-up	99.5	89.5
Swim-up to release	95.0	85.0

During 1999 and 2000, the Big Beef Creek summer chum program was generally successful in meeting the survival rate objectives. During 1999, survival at the Big Beef Creek facility was 99% from eyed egg to release. During 2000, survival rates were 97% from green egg to eye-up, 99% from eye-up to swim-up, and 99% from swim-up to release (pers. comm., S. Schroeder, WDFW).

Hatchery operations - Records of fish culture activities are regularly maintained and compiled. Information available includes protocols and procedures used; temperature unit records by developmental stage; ponding, feeding, rearing and release data; production numbers, survival estimates, sizes at release, and recommendations for facility or protocol improvements.

Broodstocking and egg sources - During 1999, all summer chum eggs were collected from Quilcene stock and transferred in from QNFH. During 2000, a total of 26,890 green eggs were obtained from female summer chum returning to Big Beef Creek and 55,500 eyed eggs were transferred in from QNFH. During 1999 and 2000, fry were successfully reared, exceeded the target average size of 1 gram and were released during February and March each year. During 2000, eyed eggs from Quilcene stock and eyed eggs from females returning to Big Beef Creek received differential otolith marks to identify the two groups upon return as adults.

To represent the demographics of the donor population, 100% of the summer chum returning to Big Beef Creek were used as broodstock and Quilcene broodstock were collected as the fish arrived in Quilcene Bay and/or at a permanent trap operated by US Fish and Wildlife Service at QNFH (see Big Quilcene River, above).

Fish health - Fish health was monitored by a USFWS fish health specialist in accordance with procedures in the co-managers disease control policy. During 1999 and 2000, summer chum broodstock were sampled for the incidence of viral pathogens, there was no significant mortality to unknown causes, and fish health condition of fry prior to release was good.

GENERAL PROGRAM ASSESSMENT

The Big Beef Creek summer chum reintroduction program has generally been successful in collecting a representative sample of brood stock from the Quilcene River summer chum population. Project adult returns for the first two years have been low; however, it is too early to judge adult return success. The co-managers will continue to monitor the adult returns. Consistent with the standards set in the SCSCI and HGMP, the expected duration of the program is a maximum of 12 years (3 generations) beginning with brood year 1996.

The following outline describes how the Big Beef reintroduction project has addressed the program objectives described in section 3.2.3.4 of the SCSCI.

Objective 1: Release Quilcene River-origin fry into the historical habitat of the Big Beef Creek population. Monitor adult returns from the initial releases and evaluate the natural spawning success.

- Quilcene River fry have been released in Big Beef Creek since the program began with brood year 1996 (Table 21). Adult returns have been monitored (Table 1 and Appendix Report 1) and natural spawning success will be monitored based on sampling to differentiate supplementation-origin, otolith-marked returning adults from natural-origin returning adults.

Objective 2: Determine if self-sustaining, viable population has been established.

- Continued monitoring of the adult returns will provide the basis for determining success in establishing a self-sustaining, viable population.

Objective 3: Develop and maintain, for up to 12 years (beginning in 1996), a population comprised of supplemented and naturally spawning fish.

- Program is still in progress and it is too early to judge success in developing and maintaining Big Beef Creek population of fish.

Objective 4: Implement a study to identify and compare wild and hatchery-origin chum spawner productivity, and survival from out-migration to adult return. Monitor and evaluate the effectiveness of the supplementation program, as measured by consistency with criteria set forth in section 3.2.2.3 (of SCSCI). Report the results of the program each year.

- No study was implemented in 1999 or 2000; the study would have been severely limited by the low adult returns in those years. Monitoring and evaluation of the supplementation program is reported above as part of this program description. The Big Beef program is consistent with the aforementioned supplementation criteria.

LILLIWAUP CREEK

A supplementation program began on Lilliwaup Creek in 1992 as a cooperative project between HCSEG and WDFW. In 1994, LLTK assumed the role of the primary project operator. Through 1997, there were difficulties in collecting adequate numbers of brood stock from Lilliwaup Creek. Attempts in this regard were complicated by the lack of a fish collection weir, low overall summer chum return levels, and the presence (in odd-numbered years) of pink salmon in the same stream areas as summer chum. Beginning in 1998, WDFW was able to provide limited funding for this project, allowing for the installation of a trap in the lower creek, increased agency assistance during fish spawning, and increased monitoring and evaluation of the supplementation program.

ANNUAL PRODUCTION

A summary of the production for each brood year of the project is provided in Table 22.

Table 22. Lilliwaup Creek summer chum supplementation program, brood years 1992-2000.

Brood year	Broodstock Males	Broodstock Females	Broodstock Total	Natural spawners	Percent removed	Fed fry released	Release size (gms)	Release date
1992	—	—	18	90	16.70	20,000	0.4	March
1993	—	—	10	72	12.20	12,000	fed	March
1994	—	—	12	105	10.30	15,000	fed	March
1995	—	—	0	79	0.00	0	—	—
1996	—	—	12	40	23.10	15,000	fed	March
1997	11	7	18	10	64.30	14,200	1.0	3/1/98
1998	9	12	21	3	87.50	17,200	0.7	2/24/99
1999	7	6	13	0	100.00	17,400	1.5	3/11/00
2000	13	7	20	2	90.90	14,800	1.4	3/12/01

MONITORING AND EVALUATION

Fish marking and mark recovery - Beginning with brood year 1997, the otoliths of summer chum salmon embryos produced in the supplementation program on Lilliwaup Creek were thermally mass-marked (otolith-marked) prior to release as fry to distinguish them from other summer chum returning to Lilliwaup Creek. During 1999 and 2000, a temporary fish trap was operated throughout the summer chum return to enumerate spawners and to collect information on fish origin and age composition (see Section 2, Stock Assessment). Beginning in 2001, examination of otoliths recovered from spawned adults will provide a method to separate the number of supplementation (hatchery) fish from the number of naturally spawning (wild) fish and/or strays from other supplementation programs and assist in determining the contribution of the supplementation program to the summer chum population.

Adult returns - It is unknown whether the Lilliwaup Creek supplementation program has been successful in contributing to the return of adult summer chum. Few summer chum continue to return to Lilliwaup Creek and otolith mark analysis is not currently available.

Genetic and age sampling - The co-managers continued GSI allozyme and/or DNA collections for summer chum in the Region, including samples from Lilliwaup during 1999 and 2000 (see Tables 5 and 6 in Stock Assessment section). Recent GSI samples have not yet been analyzed. Scales were also sampled to age the fish (Tables 5, 6, 8 and 9).

Hatchery survival rates - The SCSCI establishes survival rate objectives for the program during incubation and rearing. The following survival rate objectives for each life stage are applied to all programs; these rates are used as criteria for measuring the effectiveness of each program:

Chum Life Stage	% Survival by Life Stage	Cum. % Survival from Green Egg
Green egg to eye-up	90.0	90.0
Eye-up to Swim-up	99.5	89.5
Swim-up to release	95.0	85.0

During 1999 and 2000, the Lilliwaup Creek summer chum program was generally successful in meeting the survival rate objectives. During 1999 and 2000, survival at the Lilliwaup Creek facility exceeded 90% from eyed egg to release (pers. comm., S. Schroeder, WDFW).

Hatchery operations - Records of fish culture activities are regularly maintained and compiled. Information available includes protocols and procedures used; temperature unit records by developmental stage; ponding, feeding, rearing and release data; production numbers, survival estimates, sizes at release, and recommendations for facility or protocol improvements.

Broodstocking and egg sources - To represent the demographics of the donor population at the current extremely low population levels, the intent is to use 100% of the summer chum returning to Lilliwaup Creek as broodstock. During BY 1999 and BY 2000, all or nearly all of the summer chum returning to Lilliwaup Creek were included in the supplementation program; in 2000, two summer chum spawned downstream of the trap.

Fish health - Fish health was monitored by a WDFW fish health specialist in accordance with procedures in the co-managers disease control policy. During 1999 and 2000, summer chum broodstock were sampled for the incidence of viral pathogens, there was no significant mortality to unknown causes, and fish health condition of fry prior to release was good.

GENERAL PROGRAM ASSESSMENT

Adult return levels have not improved since the program began; escapements have been less than 40 spawners in each of the last four years. Program operational improvements begun in 1998 may lead to future increased adult returns. Otolith mark analysis of returning adults will not be available until 2001. The co-managers will continue to monitor the adult returns. Consistent with the standards set in the SCSCI and HGMP, the expected duration of the program is a maximum of 12 years (3 generations) beginning with brood year 1992.

The following outline describes how the Lilliwaup supplementation project has addressed the program objectives described in section 3.2.3.4 of the SCSCI.

Objective 1: Develop and maintain, for up to 12 years (beginning in 1992), a population comprised of supplemented and naturally spawning fish.

- The population of returning adults has been slow to build (Table 1, Appendix Table 1). Program operational improvements begun in 1998 may lead to future increased adult returns.

Objective 2: Boost numbers of naturally produced fish using the indigenous population as a donor.
- The natural population is being used as a donor in a continuing effort to boost the population numbers.

Objective 3: Monitor and evaluate the effectiveness of the supplementation program as measured by consistency with criteria in section 3.2.2.3 (of SCSCI). Report the results of the program each year.
- Monitoring and evaluation of the supplementation program is reported above as part of this Lilliwaup project report. The program is consistent with the aforementioned supplementation criteria.

HAMMA HAMMA RIVER

The Hamma Hamma multi-species salmonid recovery project was developed by HCSEG with support from others. Out of this effort evolved the Hamma Hamma supplementation project on John Creek, a Hamma Hamma River tributary. A review of freshwater habitat conditions, summer chum escapements, potential causes for decline in escapement, and current restoration efforts in Hood Canal by the co-managers and cooperators, led to the recommendation to initiate a summer chum supplementation project with brood year 1997.

ANNUAL PRODUCTION

A summary of the production for each brood year of the project is provided in Table 23.

Table 23. Hamma Hamma River summer chum supplementation program, brood years 1997-2000.

Brood year	Broodstock			Natural spawners	Percent removed	Fed fry released	Release size (gms)	Release date
	Males	Females	Total					
1997	9	5	14	104	11.8	12,000	1.0	3/1/98
1998	15	17	32	95	22.4	2,800	1.0	3/15/99
1999	21	22	43	210	16.9	51,600	1.1-1.5	3/11, 3/25/00
2000	30	26	56	173	24.4	55,400	1.1-1.2	3/12, 3/20/01

MONITORING AND EVALUATION

Fish marking and mark recovery - Beginning with brood year 1997, the otoliths of summer chum salmon embryos produced in the supplementation program on Hamma Hamma River were thermally mass-marked (otolith-marked) prior to release as fry to distinguish them from other summer chum returning to Hamma Hamma River. During 1999 and 2000, spawning ground surveys were conducted throughout the summer chum return to enumerate spawners and to collect information on fish origin and age composition (see Section 2, Stock Assessment).

Adult returns - Beginning in 2001, examination of otoliths recovered from spawned adults will provide a method to separate the number of supplementation (hatchery) fish from the number of naturally spawning (wild) fish and/or strays from other supplementation programs and assist in determining the contribution of the supplementation program to the summer chum population. During 2000, only age-3 adults could have been otoloith-marked because otolith marks were first applied in 1997. Of 10 age-3 adults sampled during 2000, two were otolith-marked and eight were unmarked.

Genetic and age sampling - The co-managers continued GSI allozyme and/or DNA collections of summer chum in the Region, including samples from Hamma Hamma during 1999 and 2000 (see Tables 5 and 6 in Stock Assessment section). Recent GSI samples have not yet been analyzed. Scales have also been sampled to age fish (Tables 5, 6, 8 and 9).

Hatchery survival rates - The SCSCI establishes survival rate objectives for the program during incubation and rearing. The following survival rate objectives for each life stage are applied to all programs; these rates are used as criteria for measuring the effectiveness of each program:

Chum Life Stage	% Survival by Life Stage	Cum. % Survival from Green Egg
Green egg to eye-up	90.0	90.0
Eye-up to Swim-up	99.5	89.5
Swim-up to release	95.0	85.0

During 1999 and 2000, the Hamma Hamma summer chum program was generally successful in meeting the survival rate objectives. Survival at the John Creek site and LLTK Lilliwaup Hatchery each exceeded 90% from eyed egg to release (pers. comm., S. Schroeder, WDFW).

Hatchery operations - Records of fish culture activities are regularly maintained and compiled. Information available includes protocols and procedures used; temperature unit records by developmental stage; ponding, feeding, rearing and release data; production numbers, survival estimates, sizes at release, and recommendations for facility or protocol improvements.

During BY 1998, there was a catastrophic loss of eggs and alevin at the John Creek remote site due to a landslide which affected the spring water source to the single remote site incubator (RSI) being used. During BY 1999 and BY2000, eggs from each female summer chum were incubated and reared at multiple sites at John Creek. In addition, beginning with BY 1999, Hamma Hamma summer chum eggs are incubated and initially reared at both the John Creek remote site and LLTK Lilliwaup Hatchery to further minimize risk. All eggs are incubated at John Creek until eyed and then transferred to the LLTK Lilliwaup Hatchery for otolith marking. About one-half of the eggs are returned to RSIs at John Creek to hatch and the eggs left at LLTK Lilliwaup are hatched, ponded at button-up, fed for one week, and returned to John Creek where they are placed into raceways with the other Hamma Hamma fish. All fish are released as fed fry into John Creek. The John Creek and LLTK Lilliwaup groups received differential otolith marks to identify them upon return as adults.

Broodstocking and egg sources - To represent the demographics of the donor population, summer chum broodstock are collected as the fish enter the stream, proportional to the timing, weekly abundance, and duration of the total return to the river. Fish not collected for broodstock spawn naturally in the Hamma Hamma River or John Creek.

Fish health - Fish health was monitored by a WDFW fish health specialist in accordance with procedures in the co-managers disease control policy. During 1999 and 2000, summer chum broodstock were sampled for the incidence of viral pathogens, there was no significant mortality to unknown causes, and fish health condition of fry prior to release was good.

GENERAL PROGRAM ASSESSMENT

It appears that the Hamma Hamma River summer chum supplementation program was generally successful in collecting a representative sample of brood stock from the natural Hamma Hamma River summer chum population. Consistent with the standards set in the SCSCI and HGMP, the expected duration of the program is a maximum of 12 years (3 generations) beginning with brood year 1997. It is too early in the program to assess the success of adult returns. The co-managers are monitoring the returns.

The following outline describes how the Hamma Hamma supplementation project has addressed the program objectives described in section 3.2.3.4 of the SCSCI.

Objective 1: Determine if effective broodstock collection methods can be developed that will conform to the criterion of this plan.

- In 1999, WDFW provided greater oversight and participation in the broodstocking effort leading to a more effective collection of of brood stock throughout the run. Broodstocking is now consistent with the specified operational criteria of the SCSCI (section 3.2.2.3) and the program has been successful in meeting its broodstocking and production objectives (Table 23).

Objective 2: Develop and maintain, for 12 years (beginning in 1997), a population comprised of supplemented and natural spawning fish using hatchery and wild-origin broodstock.

- Project is still in progress but so far the population is being maintained (Table 23) and is expected to grow in the future.

Objective 3: Boost the number of natural fish in the Hamma Hamma.

- Boost of naturally spawning fish and development of a self-sustaining natural stock is expected to occur over time. Success in meeting this objective should be determined by monitoring progress over the course of the project.

Objective 4: Distribute production throughout appropriate areas within the drainage to ensure that available spawning habitat is utilized (e.g., John Creek).

- Fry of the supplementation project are released into John Creek and pass down through the available habitat in the lower Hamma Hamma River.

Objective 5: Monitor and evaluate the effectiveness of the supplementation program as measured by consistency with criteria in section 3.2.2.3 (of SCSCI). Report the results of the program each year.
- Monitoring and evaluation of the supplementation program is reported above as part of this Hamma Hamma project report. The project is consistent with the aforementioned supplementation criteria.

UNION RIVER

The Union River supplementation program is a cooperative effort between the Hood Canal Salmon Enhancement Group and WDFW and was initiated in brood year 2000. The strategy is to boost the abundance of the Union River population to allow for transfers of surplus fish for a reintroduction of summer chum on the Tahuya River using Union River stock. The goal is to reintroduce and restore a healthy, natural, self-sustaining population of summer chum in the Tahuya River. The supplementation program, its goal, objectives, and guidelines are presented in an HGMP consistent with the SCSCI.

The Union River supplementation program was initiated after completion of the SCSCI. Thus, a more detailed description of this project is provided here and, like Appendix Report 3.2 of the SCSCI, includes program objectives, broodstock and production data, and operating procedures and objectives.

The following are objectives for the supplementation program on the Union River summer chum stock:

Objective 1 - Retain future options for supplementation of the Union River stock. Develop and maintain, for 12 years (beginning in 2000), a population comprised of supplemented and naturally spawning fish using hatchery and wild-origin broodstock on the Union River.

Objective 2 - Boost the numbers of naturally produced fish in the Union River using the indigenous population as the donor. Procure no greater than 50 % of the total annual number of returning females when the anticipated spawning population exceeds 250 fish. If the anticipated spawning population is less than 250, follow broodstock removal criteria set forth in the SCSCI for small population sizes. Produce a maximum of 86,000 fed fry each year for release into the Union River.

Objective 3 - Monitor and evaluate the effectiveness of the supplementation program. Report the results of the program each year.

Objective 4 - Reintroduce summer chum into the Tahuya River. This can proceed when the Union River stock (1) meets an identified spawner escapement objective, (2) provides the egg take needs of any ongoing Union River supplementation program, and (3) provides a minimum of 25 pairs required for a reintroduction program. Tahuya River production levels and performance standards will be described in an amended HGMP for the program.

The current program is comprised of the following: (1) collection of summer chum broodstock at a permanent trap at R.M. 0.3 on the Union River; (2) holding and spawning of broodstock at the trap site; (3) transfer of eggs and milt to WDFW George Adams Hatchery for fertilization and initial incubation; (4) transfer of eyed eggs from George Adams Hatchery to remote site incubators (RSIs) at Huson Springs facility on tributary to Union River with volitional release from RSIs into 16' x 3' x 3' fiberglass raceways; (5) transfer of swim-up fry from George Adams Hatchery to raceways at Huson Springs facility; (6) rearing of fed fry to ~1 gram for release into Huson Springs and/or for transport to a location near the Union River estuary for release.

ANNUAL PRODUCTION

A summary of the production for each brood year of the project is provided in Table 24.

Table 24. Union River summer chum supplementation program, brood years 1997-2000.

Brood year	Broodstock			Natural spawners	Percent removed	Fed fry released	Release size (gms)	Release date
	Males	Females	Total					
2000	30	32	62	682	8.3	75,876	1	2/21, 2/27/01

MONITORING AND EVALUATION

Fish marking and mark recovery - Brood year 2000 was the first year of the Union River supplementation program. The otoliths of summer chum salmon embryos produced in the program were thermally mass-marked (otolith-marked) prior to release as fry to distinguish them from naturally-spawned summer chum in the Union River. During 2000, a permanent trap was operated throughout the summer chum return to enumerate spawners and to collect information on fish origin and age composition (see Section 2, Stock Assessment).

Adult returns - Beginning in 2003, examination of otoliths recovered from spawned adults will provide a method to separate the number of supplementation (hatchery) fish from the number of naturally spawning (wild) fish and/or strays from other supplementation programs and assist in determining the contribution of the supplementation program to the summer chum population.

Genetic age sampling - The co-managers continued GSI allozyme and/or DNA collections of summer chum, including samples from Union River during 2000 (see Tables 5 and 6 in Stock Assessment section). Recent GSI samples have not yet been analyzed. Scales were also sampled to age the fish (Tables 5, 6, 8 and 9).

Hatchery survival rates - The SCSCI and the HGMP prepared for the Union River program establish survival rate objectives during incubation and rearing. The following survival rate objectives for each

life stage are applied to all programs; these rates are used as criteria for measuring the effectiveness of each program:

Chum Life Stage	% Survival by Life Stage	Cum. % Survival from Green Egg
Green egg to eye-up	90.0	90.0
Eye-up to Swim-up	99.5	89.5
Swim-up to release	95.0	85.0

The Union River summer chum program was generally successful in meeting the survival rate objectives. During 2000, survival rates were 95% from green egg to eye-up at George Adams Hatchery, 99% and 99% from eye-up to swim-up at George Adams Hatchery and Union River facility, respectively, and 95% from swim-up to release (pers. comm., E. Jouper, WDFW).

Hatchery operations - Records of fish culture activities are regularly maintained and compiled. Information available includes protocols and procedures used; temperature unit records by developmental stage; ponding, feeding, rearing and release data; production numbers, survival estimates, sizes at release, and recommendations for facility or protocol improvements.

During 2000, fry were successfully reared to the target average size of 1 gram and were released during February 2001 into Huson Springs and the Union River estuary. Two different otolith marks were applied at George Adams Hatchery to identify, upon return as adults, the group transferred as eyed eggs and the group transferred as swim-up fry.

Broodstocking and egg sources - To represent the demographics of the donor population, summer chum broodstock are collected randomly as the fish arrive at a temporary fish trap, proportional to the timing, weekly abundance, and duration of the total return to the river. Fish not retained for use as broodstock are released upstream of the trap site to spawn naturally.

Fish Health - Fish health was monitored by a WDFW fish health specialist in accordance with procedures in the co-managers disease control policy. During 2000, summer chum broodstock were sampled for the incidence of viral pathogens, significant mortality to unknown causes was sampled for histopathological study, recommendations on fish cultural practices were provided based on the fish health condition and implemented, and fish health condition of fry prior to release was good.

A fish health exam was performed on 2/8/01 due to a noted increase in mortality in the raceways containing RSI-hatched fish. The examination found bacterial gill disease with secondary infections of coldwater disease and fungus. A bath treatment with hydrogen peroxide was performed as prescribed. A follow-up fish health exam on 2/22/01 found that the treatment was not effective, so a flow-through treatment with potassium permanganate was performed with successful results. It was concluded that the bacterial gill disease was caused by "sour water" conditions in the raceways. Recommendations were made to change the configuration of the raceways to improve flow patterns, exchange rates, and

maximize fish utilization of the entire raceway. These changes will be implemented for the 2001 brood year.

GENERAL PROGRAM ASSESSMENT

It appears that the Union River summer chum supplementation program was generally successful in collecting a representative sample of brood stock from the natural Union River summer chum population. Consistent with the standards set in the SCSCI and HGMP, the expected duration of the program is a maximum of 12 years (3 generations) beginning with brood year 2000. The co-managers will monitor the adult returns from fry released from the supplementation program.

The following outline describes how the Union supplementation project has addressed the program objectives described at the beginning of this Union project assessment.

Objective 1: Retain future options for supplementation of the Union stock. Develop and maintain, for 12 years (beginning in 2000), a population comprised of supplemented and naturally spawning fish using hatchery and wild-origin broodstock on the Union River.
- Project initiated with brood year 2000.

Objective 2: Boost the numbers of naturally produced fish in the Union River using the indigenous population as the donor. Procure no greater than 50% of the total annual number of returning females when the anticipated spawning population exceeds 250 fish. If the anticipated spawning population is less than 250, follow broodstock removal criteria set forth in the SCSCI for small population sizes. Produce a maximum of 86,000 fed fry each year for release into the Union River.
- Criteria for broodstocking have been met for brood year 2000, the first year of project operation, and approximately 76,000 fed fry were released (Table 24).

Objective 3: Monitor and evaluate the effectiveness of the supplementation program. Report the results of the program each year.
- Monitoring and evaluation of the supplementation program is reported above as part of this Union project report. The project generally has been consistent with the aforementioned criteria.

Objective 4: Reintroduce summer chum into the Tahuya River.
- This phase of the project has not yet begun.

STRAIT OF JUAN DE FUCA REGION

SALMON CREEK

A supplementation program was begun on Salmon Creek in 1992 and was originally conceived with the objectives to rebuild and stabilize the Salmon Creek population and to allow for the transfer of surplus eggs or fry to Chimacum Creek to reintroduce summer chum there.

ANNUAL PRODUCTION

A summary of the production for each brood year of the project is provided in Table 25.

Table 25. Salmon Creek summer chum supplementation program, brood years 1992-2000.

Brood year	Broodstock			Natural spawners	Percent removed	Fed fry[1] released	Release size[1] (gms)	Release date
	Males	Females	Total					
1992	35	27	62	371	14.3	19,200	1.1	5/7/98
1993	29	23	52	400	11.5	44,000	1.8	4/27/94
1994	12	12	24	137	14.9	2,000	1.3	3/31/95
1995	35	18	53	538	9.0	38,808	1.3	4/23/96
1996	59	50	109	785	12.2	62,000[2]	1.3	4/8, 4/24/97
1997	60	50	110	724	13.2	71,821[2]	1.0-1.3	3/31, 4/16/98
1998	65	56	121	1023	10.6	67,832[2]	1.0-1.3	3/31, 4/21,5/4/99
1999	34	31	65	434	13.0	34,680[2]	1.3-2.6	4/23, 6/12/00
2000	71	65	136	710	16.1	90,435[2]	0.6-1.1	4/14, 4/26/01

[1] Release number and size data from Wild Olympic Salmon (1997; 1998) and WDFW files.
[2] Release numbers do not include 28,788; 36,840; 70,050; and 73,200 fry of Salmon Creek-origin, released into Chimacum Creek in 1997, 1998, 1999, 2000, and 2001, respectively.

MONITORING AND EVALUATION

Fish marking and mark recovery - The otoliths of summer chum salmon embryos produced in the supplementation program on Salmon Creek are thermally mass-marked (otolith-marked) prior to release. Spawning ground surveys were conducted throughout the summer chum return to enumerate spawners and to collect information on fish origin and age composition (see Section 2, Stock Assessment). Examination of otoliths recovered from spawned adults provides a method to separate the number of supplementation (hatchery) fish from the number of naturally spawning (wild) fish and assists in determining the contribution of the supplementation program to the summer chum population.

Adult returns - The Salmon Creek supplementation program has been very successful in contributing to the return of adult summer chum The co-managers now have data from several years and estimates of the return from fed fry to adult for summer chum reared in the supplementation program at Salmon Creek are presented in Table 26 for the 1997, 1998, 1999 and 2000 return years and in Table 27 for the 1994, 1995, 1996 and 1997 brood years. It is important to note that the otolith marks were assessed by Jeff Grimm of the WDFW Otolith Lab as "difficult to recognize" (and differed only slightly from the natural otolith patterns of wild specimens) for the 1993 and 1994 brood years. Thus, the number, percentage and return rate for age 3 adults in 1997 and age 4 adults in 1998 produced from the supplementation program are possibly underestimated in Tables 26 and 27.

Table 26. Return from fry to adult for summer chum salmon reared in supplementation program at Salmon Creek, as determined from otolith marks for the 1997, 1998, 1999 and 2000 return years.

					Otolith marks		Supplementation program		
Return year	Total return	Age	Age comp (%)	No. of otoliths	(%)	No.	Brood year	No. fry released	Return rate by age
1997	864	2	3.6	30	44.4	13	1995	38,800	0.03%
		3	64.3	536	8.6	46	1994	2,000	0.29%
		4	30.5	255	2.7	7	1993	44,000	0.02%
		5	1.6	13	0.0	0	—	—	—
					7.9	**66**			
1998	1134	2	0.7	8	100.0	8	1996	62,000	0.01%
		3	60.0	680	69.2	471	1995	38,800	1.21%
		4	39.3	446	11.2	50	1994	2,000	2.50%
		5	0.0	0	0.0	0	1993	44,000	0.00%
					46.6	**529**			
1999	499	2	0.0	0	0.0	0	1997	71,800	0.00%
		3	58.2	282	75.2	219	1996	62,000	0.35%
		4	40.7	197	72.9	148	1995	38,800	0.38%
		5	1.1	5	0.0	0	1994	2,000	0.00%
					73.4	**367**			
2000	846	2	6.0	51	27.3	14	1998	67,800	0.02%
		3	64.5	546	42.3	231	1997	71,800	0.32%
		4	29.0	245	66.0	162	1996	62,000	0.26%
		5	0.5	4	0.0	0	1995	38,800	0.00%
					48.1	**407**			

Table 27. Return from fry to adult for summer chum salmon reared in supplementation program at Salmon Creek, as determined from otolith marks for the 1994, 1995, 1996 and 1997 brood years.

Stream	Brood year	No. fry released	Return year	Age	No otolith-marked adults	Return rate by age
Salmon Cr.	1994	2,000	1996	2	—	—
			1997	3	46	2.30%
			1998	4	50	2.50%
			1999	5	0	0.00%
				Total	**96**	**4.80%**
	1995	38,800	1997	2	13	0.03%
			1998	3	471	1.21%
			1999	4	148	0.38%
			2000	5	5	0.01%
				Total	**637**	**1.62%**
	1996	62,000	1998	2	8	0.01%
			1999	3	219	0.35%
			2000	4	162	0.26%
			2001	5		
				Total	**389**	**0.62%**
	1997	71,800	1999	2	0	0.0%
			2000	3	231	0.32%
			2001	4		
			2002	5		
				Total	**231**	**0.32%**

Escapements of non-supplemented summer chum populations were monitored to determine the level of straying of supplementation program fish to other drainages (see Stock Assessment section).

Genetic and age sampling - The co-managers continued GSI allozyme and/or DNA collections of summer chum, including samples from Salmon Creek during 1999 and 2000; recent samples have not been analyzed (see Tables 5 and 6 in Stock Assessment section). Scales were also sampled to age the fish (Tables 5, 6, 8 and 9).

Hatchery survival rates - The SCSCI and the HGMP prepared for the Salmon Creek program establish survival rate objectives during incubation and rearing. The following survival rate objectives for each life stage are applied to all programs; these rates are used as criteria for measuring the effectiveness of each program:

Chum Life Stage	% Survival by Life Stage	Cum. % Survival from Green Egg
Green egg to eye-up	90.0	90.0
Eye-up to Swim-up	99.5	89.5
Swim-up to release	95.0	85.0

The Salmon Creek summer chum program has generally been successful in meeting the survival rate objectives. The number of eggs, swim-up fry, and fry released and the survival rates by life stage for

summer chum reared in the supplementation program at Salmon Creek Hatchery from 1992 through 2000 are presented in Table 28.

Table 28. Number of eggs, swim-up fry, and fry released and the survival rates by life stage for summer chum salmon reared in the supplementation program at Salmon Creek Hatchery, 1992 through 2000 brood years.

	Number of eggs or fry					% Survival by life stage			Cumulative % survival		
	Total		Salmon Creek Hatchery			Salmon Creek Hatchery			Salmon Creek Hatchery		
Brood year	Green eggs	Eyed eggs	Eyed eggs	Swim-up fry	Fry released	Green egg to eyed egg	Eyed egg to swim-up	Swim-up to release	Green egg to eyed egg	Eyed egg to swim-up	Swim-up to release
1992	46,980	44,280	44,280	18,684	19,200	94.3	42.2	100.0	39.8	39.8	43.4
1993	—	46,300	46,300	26,837	44,000	—	58.0	100.0	—	—	95.0
1994	—	24,200	24,200	2,000	2,000	—	8.3	100.0	—	—	8.3
1995	41,750	39,200	39,200	38,808	38,808	93.9	99.0	100.0	93.0	93.0	99.0
1996	—	114,900[1]	64,900	62,300	62,000	—	96.0	99.5	—	—	99.5
1997	133,340	112,900[1]	72,900	71,011	71,821	87.7	97.4	100.0	82.5	82.5	98.5
1998	164,300	149,100[1]	69,100	68,423	67,807	90.7	99.0	99.1	89.9	89.1	98.1
1999	87,350	78,300[1]	29,200	28,950	28,400[2]	89.6	99.1	98.1	88.9	87.2	97.3
2000	174,550	165,400[1]	91,350	90,755	90,435	94.8	99.3	99.6	94.1	93.8	99.0

[1] Total includes eggs taken for both Salmon Creek supplementation and Chimacum Creek reintroduction programs; all green eggs are incubated at Dungeness Hatchery and shipped as eyed eggs to Salmon Creek Hatchery and Chimacum Creek Hatchery.

[2] Does not include 6,300 fish transferred in June 1 at 256 fpp from Dungeness Hatchery and 6,280 released on June 12 at 175 fpp at RM 0.1 in Salmon Creek after rearing in freshwater there; total release was 34,680 fish for BY 1999.

Hatchery operations - Records of fish cultural techniques are regularly maintained and compiled. A report is prepared annually by Wild Olympic Salmon (WOS) in collaboration with WDFW which summarizes, for example, protocols and procedures, temperature unit records by developmental stage, ponding, feeding, rearing and release methods, production, survival, and recommendations for facility or protocol improvements (e.g., see WOS 2000).

Broodstocking and egg sources - To represent the demographics of the donor population, summer chum broodstock are collected randomly as the fish arrive at a temporary fish trap operated by WDFW, proportional to the timing, weekly abundance, and duration of the total return to the creek. Fish not retained for use as broodstock are released upstream of the trap site to spawn naturally. In 1998, the mean fork length and age composition were similar for naturally spawning summer chum and those used in the supplementation program (Table 29). In 1999, the mean fork length was similar for naturally spawning summer chum and those used in the supplementation program, but there was a substantial difference in the age composition of the two groups. Age composition was about 68% age 3 and 31% age 4 in the natural spawning fish compared to 42% age 3 and 57% age 4 adults in the supplementation program (Table 30). The difference in age composition may be due to the unintentional selection of larger fish for use in the supplementation program. In 1999, supplementation-

origin fish comprised about 78% of the age 3 and age 4 adults used in the supplementation program (Table 31).

Table 29. Mean fork length (FL), age composition, and sex ratio for adult summer chum salmon sampled from the natural escapement and from the supplementation program at Salmon Creek, 1998 brood year.

	Females sampled				Males sampled			Females + Males sampled			
Stream	**Age**	**No.**	**Mean FL (cm)**	**Age comp (%)**	**No.**	**Mean FL (cm)**	**Age comp (%)**	**No.**	**Mean FL (cm)**	**Age comp (%)**	**Sex ratio (M:F)**
Return year 1998											
Natural	2	0	—	0.0	2	49	1.9	2	49	1.1	All male
escapement	3	43	63	55.8	66	66	63.5	109	65	60.2	1.53
	4	34	67	44.2	36	70	34.6	70	69	38.7	1.06
	5	0	—	0.0	0	—	0.0	0	—	0.0	—
Total		**77**			**104**			**181**			
Supplementation	2	0	—	0.0	0	—	0.0	0	—	—	All male
program	3	30	67	54.5	42	69	62.7	72	68	59.0	1.40
	4	25	70	45.5	25	72	37.3	50	71	41.0	1.00
	5	0	—	0.0	0	—	0.0	0	—	0.0	—
Total		**55**			**67**			**122**			
Combined	2	0	—	0.0	2	49	1.2	2	49	0.7	All male
	3	73	65	55.3	108	67	63.2	181	66	59.7	1.48
	4	59	68	44.7	61	71	35.7	120	70	39.6	1.03
	5	0	—	0.0	0	—	0.0	0	—	0.0	—
Total	**132**				**171**			**303**			

Table 30. Mean fork length (FL), age composition, and sex ratio for adult summer chum salmon sampled from the natural escapement and from the supplementation program at Salmon Creek, 1999 brood year.

	Females sampled				Males sampled			Females + Males sampled			
Stream	Age	No.	Mean FL (cm)	Age comp (%)	No.	Mean FL (cm)	Age comp (%)	No.	Mean FL (cm)	Age comp (%)	Sex ratio (M:F)
Return year 1999											
Natural	2	0	—	0.0	0	—	0.0	0	--	0.0	—
escapement	3	30	61	78.9	46	64	62.2	76	63	67.9	1.53
	4	8	69	21.1	27	73	36.5	35	72	31.3	3.38
	5	0	—	0.0	1	74	1.4	1	74	0.9	All male
Total	**38**				**74**			**112**			
Supplementation	2	0	—	0.0	0	—	0.0	0	—	—	—
program	3	13	63	41.9	14	64	41.2	27	64	41.5	1.08
	4	17	73	54.8	20	74	58.8	37	74	56.9	1.18
	5	1	71	3.2	0	—	0.0	1	71	1.5	All female
Total	**31**				**34**			**65**			
Combined	2	0	0.0	0.0	0	—	0.0	0	—	0.0	All male
	3	43	62.3	62.3	60	64	55.6	103	63	58.2	1.40
	4	25	36.2	36.2	47	73	43.5	72	73	40.7	1.88
	5	1	1.4	1.4	1	74	0.9	2	73	1.1	1.00
Total	**69**				**108**			**177**			

Table 31. The percentage of otolith marked adult summer chum salmon observed in the natural escapement and spawned for the supplementation program at Salmon Creek, 1999 return year. Summer chum fry from the supplementation program are otolith-marked prior to release. [1]

	Natural escapement			Supplementation program			Combined		
Age and sex	# otoliths examined	# otolith marks observed	Otolith marks (%)	# otoliths examined	# otolith marks observed	Otolith marks (%)	# otoliths examined	# otolith marks observed	Otolith marks (%)
Return year 1999									
Age 2									
Males	0	0	0.0	0	0	0.0	0	0	0.0
Females	0	0	0.0	0	0	0.0	0	0	0.0
Total	**0**	**0**	**0.0**	**0**	**0**	**0.0**	**0**	**0**	**0.0**
Age 3									
Males	45	33	73.3	14	9	64.3	59	42	71.2
Females	29	22	75.9	13	12	92.3	42	34	81.0
Total	**74**	**55**	**74.3**	**27**	**21**	**77.8**	**101**	**76**	**75.2**
Age 4									
Males	25	17	68.0	20	16	80.0	45	33	73.3
Females	8	5	62.5	17	13	76.5	25	18	72.0
Total	**33**	**22**	**66.7**	**37**	**29**	**78.4**	**70**	**51**	**72.9**
Age 5									
Males	1	0	0.0	0	0	0.0	1	0	0.0
Females	0	0	0.0	1	0	0.0	1	0	0.0
Total	**1**	**0**	**0.0**	**1**	**0**	**0.0**	**2**	**0**	**0.0**

[1] None of one (0%) age 3 adults and one of one (100%) age 4 adult sampled in Snow Creek in 1999 was otolith-marked; indicating that some level of straying of supplementation program adults occurs from Salmon Creek to Snow Creek. In addition, six of 34 (18%) adults sampled in Little Quilcene River in 1999 were otolith-marked with marks applied at Salmon Creek; indicating some level of straying is occurring. Plus, none of six (0%) of adults sampled in Jimmycomelately Creek in 1999 were otolith marked.

Fish health - Fish health was monitored by a WDFW fish health specialist in accordance with procedures in the co-managers disease control policy. During 1999 and 2000, summer chum broodstock were sampled for the incidence of viral pathogens, there was no significant mortality to unknown causes, and fish health condition of fry prior to release was good. During 2000, there was a bloom of *Chaetocerous* (a spiny diatom which entangles in gills) in the saltwater net pens in Discovery Bay during April and, as a precautionary measure per a fish health specialist recommendation, the fish were released early at an average size of ~0.6 gram.

GENERAL PROGRAM ASSESSMENT

It appears that the Salmon Creek supplementation program has generally been successful in collecting a representative sample of brood stock from the natural population and very successful in contributing to

the return of adult summer chum. The high percentage of supplementation program adults in the 1998 and 1999 adult returns may be cause for concern, however. Relatively low proportions of the adult returns are collected for use as broodstock in the supplementation program each year; for example, approximately 9% and 12% were collected during 1995 and 1996, respectively (Table 25). However, the supplementation program contributes a higher proportion of returning adults as shown by otolith-mark sampling results; about 69% of age 3 adults in 1998 and 75% of age 3 and 73% of age 4 adults in 1999 were identified as supplementation-origin fish (Table 26). The estimates of natural origin returns are about 53% for 1998 and about 27% for 1999 (calculated by subtracting the estimated annual supplementation-origin percentages, shown in Table 26, from 100%).

Although some natural summer chum production is occurring in Salmon Creek, it appears that impacts to natural processes in freshwater and/or estuarine habitats are likely limiting summer chum production in Salmon Creek in some years. This re-emphasizes the need for the Salmon Creek summer chum recovery program to address all factors affecting summer chum production, including habitat, harvest, and supplementation. Several habitat restoration and/or acquisition projects have recently been proposed and funded in the freshwater and estuarine area of Salmon Creek and Discovery Bay. Completion of these habitat projects will help restore habitat function and increase summer chum production and productivity. Harvest management strategies and regimes identified in the Summer Chum Salmon Conservation Initiative are expected to result in, on the average, a total exploitation rate of 8.8% on the Salmon/Snow Creek management unit; this relatively low exploitation rate should contribute to the recovery of Salmon Creek summer chum. As noted, above, the supplementation program has already contributed substantially to the summer chum adult return to Salmon Creek.

Consistent with the standards set in the SCSCI and HGMP for the program, the expected duration of the program is a maximum of 12 years (3 generations) beginning with brood year 1992. The co-managers will continue to monitor the adult returns from fry released from the supplementation program.

The following outline describes how the Salmon Creek supplementation project has addressed the program objectives described in section 3.2.3.4 of the SCSCI.

Objective 1: Retain future options for supplementation of the Salmon/Snow stock. Develop and maintain, for 12 years (beginning in 1992), a population comprised of supplemented and naturally spawning fish using hatchery and wild-origin broodstock on Salmon Creek.
- The project is meeting this objective (see Table 25).

Objective 2: Boost the numbers of naturally produced fish in Salmon Creek using the indigenous population as the donor. Procure no greater than 20 % of the total annual number of returning females when the anticipated spawning population exceeds 250 fish. If the anticipated spawning population is less than 250, follow broodstock removal criteria set forth in the SCSCI for small population sizes. Produce a maximum of 60,000 fed fry each year.
- The project has been successful in meeting this objective (Table 25).

Objective 3: Monitor and evaluate the effectiveness of the supplementation program. Report the results of the program each year.

- Monitoring and evaluation of the supplementation program is reported above as part of this Salmon Creek project report.

Objective 4: Support reintroduction of summer chum into Chimacum Creek.

- Project has been successful in meeting this objective (see Table 25 (footnote #2) and Table 32).

Objective 5: Manage Snow Creek as wild production area.
There is currently no supplementation program in Snow Creek which is being managed as a wild production area.

CHIMACUM CREEK

Beginning with brood year 1996, eyed eggs were transferred in from Salmon Creek for the Chimacum Creek reintroduction program.

ANNUAL PRODUCTION

A summary of the production for each brood year of the project is provided in Table 32.

Table 32. Chimacum Creek summer chum reintroduction program, brood years 1996-2000.

Brood year	No. eggs received	No. fed fry released	Release size (gm)	Release date
1996	30,000	28,788	0.4-1.5	3/23, 5/9/97
1997	40,000	36,840	0.7	3/27, 4/11, 4/19/98
1998	80,000	70,050	0.6-0.8	3/26, 3/28, 4/21/99
1999	41,300	39,170	0.4-0.8	3/20, 3/31, 4/7, 4/24/00
2000	74,050	73,300	0.8-1.2	4/5, 4/17, 4/18, 4/23, 5/3, 5/10/01

MONITORING AND EVALUATION

Fish marking and mark recovery - Beginning with brood year 1999, the otoliths of summer chum salmon embryos produced in the supplementation program on Chimacum Creek were thermally mass-marked (otolith-marked) prior to release to distinguish them from naturally-spawned summer chum in Chimacum Creek. Spawning ground surveys were conducted throughout the summer chum return to enumerate spawners and to collect information on fish origin and age composition (see Section 2, Stock Assessment). Beginning in 2002, examination of otoliths recovered from spawned adults provides a method to separate the number of supplementation (hatchery) fish from the number of naturally spawning (wild) fish and assists in determining the contribution of the supplementation program to the summer chum population.

Adult returns - The Chimacum Creek reintroduction program has been successful in contributing to the return of adult summer chum. An estimated 38 and 52 summer chum returned to spawn in Chimacum Creek during fall 1999 and fall 2000, respectively. This was the first natural spawning of summer chum in Chimacum Creek since the mid-1980's.

Genetic and age sampling - The co-managers continued GSI allozyme and/or DNA collections of summer chum, including samples from Chimacum Creek during 2000 (see Tables 5 and 6 in Stock Assessment section). Recent GSI samples have not yet been analyzed. Scales have also been sampled to age the fish (Tables 5, 6, 8 and 9).

Hatchery survival rates - The SCSCI and the HGMP prepared for the Chimacum Creek program establish survival rate objectives during incubation and rearing. The following survival rate objectives for each life stage are applied to all programs; these rates are used as criteria for measuring the effectiveness of each program:

Chum Life Stage	% Survival by Life Stage	Cum. % Survival from Green Egg
Green egg to eye-up	90.0	90.0
Eye-up to Swim-up	99.5	89.5
Swim-up to release	95.0	85.0

The Chimacum Creek summer chum program has generally been successful in meeting the survival rate objectives. The number of eggs, swim-up fry, and fry released and the survival rates by life stage for summer chum reared in the supplementation program at Chimacum Creek Hatchery from 1996 through 2000 are presented in Table 33.

Table 33. Number of eggs, swim-up fry, and fry released and the survival rates by life stage for summer chum salmon reared in the reintroduction program at Chimacum Creek Hatchery, 1996 through 2000 brood years.

	Number of eggs or fry					% Survival by life stage				
	Total[1]		Chimacum Creek Hatchery			Chimacum Creek Hatchery				
Brood year	Green eggs	Eyed eggs	Eyed eggs	Swim-up fry	Fry released	Green eggs to eyed eggs	Eyed egg to swim-up	Swim-up to release	Green egg to release	Eyed egg to release
1996	—	114,90	50,000	31,243	28,788	—	62.5	92.1	—	57.6
1997	133,34	0	40,000	38,000	36,840	84.7	95.0	96.9	78.0	92.1
1998	0	112,90	80,000	73,750	70,050	90.7	92.2	95.0	79.5	87.6
1999	164,30	0	41,300	40,880	39,170	89.6	99.0	95.8	85.0	94.8
2000	0	149,10	74,050		73,300	94.8			93.8	99.0
	87,350	0								
	174,55	78,300								
	0	165,40								
		0								

1 Total includes eggs taken for both Salmon Creek supplementation and Chimacum Creek reintroduction programs; all green eggs are incubated at Dungeness Hatchery and shipped as eyed eggs to Salmon Creek Hatchery and Chimacum Creek Hatchery.

Hatchery operations - Records of fish culture activities are regularly maintained and compiled. A report is prepared annually by Wild Olympic Salmon (WOS) in collaboration with WDFW which summarizes, for example, protocols and procedures used; temperature unit records by developmental stage; ponding, feeding, rearing and release data; production numbers, survival estimates, sizes at release, and recommendations for facility or protocol improvements. (e.g., see WOS 2000).

During brood year 1999, fry reared at the Chimacum Creek Hatchery were released early (i.e., at 0.4 to 0.8 gram vs. goal of 1 gram) due to water quantity, water quality, and rearing vessel limitations. Several improvements were recommended (see WOS 2000) and these were made at the hatchery (a freshwater facility) prior to brood year 2000; in addition, two saltwater net pens were installed near the mouth of Chimacum Creek to rear about one-half of the fry prior to release. Brood year 2000 fry were successfully reared to a size of 0.8 to 1.2 grams in the freshwater and saltwater facilities and released during April and May, 2001. Fry reared at the freshwater and saltwater sites received differential otolith marks during 2000.

Broodstock and egg sources - To represent the demographics of the donor population, summer chum broodstock are collected randomly as the fish arrive at a permanent trap operated by WDFW on Salmon Creek, proportional to the timing, weekly abundance, and duration of the total return to the creek (see Salmon Creek, above).

Fish health - Fish health was monitored by a WDFW fish health specialist in accordance with procedures in the co-managers disease control policy. During 1999 and 2000, summer chum broodstock were sampled for the incidence of viral pathogens. During 1999, low water levels and increased water temperatures in the spring-lake water source and resultant increased loading rates contributed to significant mortalities during rearing; when mortality reached >1% per day, the fish were released into the lower reach of Chimacum Creek per the direction of a WDFW fish health specialist. During 2000, there was no significant mortality to unknown causes and fish health condition of fry prior to release was good.

GENERAL PROGRAM ASSESSMENT

It appears that the Chimacum Creek summer chum reintroduction program has generally been successful in collecting a representative sample of brood stock from the natural Salmon Creek summer chum population and successful in contributing to the return of adult summer chum to Chimacum Creek. Consistent with the standards set in the SCSCI and HGMP for the program, the expected duration of the program is a maximum of 12 years (3 generations) beginning with brood year 1996. The co-managers will continue to monitor the adult returns from fry released from the reintroduction program.

The following outline describes how the Chimacum supplementation project has addressed the program objectives described in section 3.2.3.4 of the SCSCI.

Objective 1: Release 80,000 Salmon Creek-origin reared on Chimacum Creek into the lower watershed or the immediate estuary. Monitor adult returns and evaluate the natural spawning success of these adults, where success is measured by return of the naturally produced adult offspring.

- Production levels have been improving over the course of the project (Table 32). Adult returns are being monitored (Table 1, Appendix Report 1). The success of naturally produced adult offspring will be evaluated based on longer term monitoring of otolith-marked fish.

Objective 2: Develop and maintain, for 12 years (beginning in 1996), a population comprised of supplemented and natural spawning fish using hatchery and wild-origin broodstock.

- Project is still progressing but successful initial returns (Appendix Table 2) suggest the project is succeeding.

Objective 3: Monitor and evaluate the effectiveness of the supplementation program. Report the results of the program each year.

- Monitoring and evaluation of the supplementation program is reported above as part of this Chimacum project report. The project generally has been consistent with the aforementioned criteria.

JIMMYCOMELATELY CREEK

In the SCSCI, the Jimmycomelately (JCL) Creek summer chum stock was determined to be at a high risk of extinction and a supplementation project was recommended. A supplementation project was initiated with the 1999 brood year and is a cooperative effort between WDFW, North Olympic Salmon Coalition, and Wild Olympic Salmon. The SCSCI also noted that habitat impacts are high and may be contributing to the risk; and recommended that habitat protection and recovery measures should be addressed concurrent with supplementation project development. Habitat restoration projects have been prioritized, funded, and initiated in freshwater and estuarine areas of JCL Creek.

The Jimmycomelately Creek supplementation program was initiated after completion of the SCSCI. Thus, a more detailed description of this project is provided here and, like Appendix Report 3.2 of the SCSCI, includes program objectives, broodstock and production data, and operating procedures and objectives.

The goal is to contribute to the restoration of a healthy, natural, self-sustaining population of summer chum that will maintain the genetic characteristic of the native JCL stock. The supplementation program, its goal, objectives, and guidelines are presented in an HGMP and is consistent with the SCSCI.

The following are objectives for using supplementation in the recovery of the JCL summer chum stock as presented in the SCSCI and HGMP for the program:

1. initiate a supplementation program using the indigenous JCL summer chum broodstock, thus retaining future options for recovery of the JCL population;

2. boost the numbers of naturally produced fish in JCL Creek using the indigenous population as the donor; develop and maintain, for 12 years, a population comprised of supplemented and naturally spawning fish using hatchery and wild-origin broodstock;

3. monitor and evaluate, and annually report the effectiveness of the supplementation program, as measured by consistency with criteria set forth in the SCSCI.

The current program is comprised of the following: (1) collection of summer chum broodstock at a permanent trap at R.M. 0.1 on JCL Creek; (2) holding and spawning of broodstock at the trap site; (3) transfer of eggs and milt to WDFW Hurd Creek Hatchery for fertilization and initial incubation; (4) transfer of eyed eggs from Hurd Creek Hatchery to remote site incubators (RSIs) at facility on a spring-fed tributary to JCL Creek with volitional release from RSIs into 4' and 6' diameter fiberglass tanks; (5) transfer of swim-up fry from Hurd Creek Hatchery to tanks at JCL Creek facility; (6) rearing of fed fry to ~1 gram for release into JCL Creek near the estuary.

During 1999, there was one difference in that fed fry were transferred from Hurd Creek Hatchery to the remote site on JCL Creek and reared/acclimated for one month prior to release into JCL Creek near the estuary. This was done to optimize the survival of the low number of eyed eggs (4,130) and fry (3,925) available from the very low return of adults (n=7) and also since the remote site was new and untested. Rearing at the remote site went well and 3,880 fry were released at a size of ~1 gram in April.

In addition, because the well water used for incubation at Hurd Creek is warmer and less variable diurnally than ambient water temperatures in JCL Creek, the eggs were chilled to slow accumulation of temperature units (TUs). By controlling (reducing) the TUs at Hurd Creek Hatchery prior to transferring eyed eggs or swim-up fry to the JCL remote site, fry were released at an appropriate size during April at a time when productivity in the marine environment would be high.

ANNUAL PRODUCTION

A summary of the production for each brood year of the project is provided in Table 34.

Table 34. Jimmycomelately Creek summer chum supplementation program, brood years 1999-2000.

Brood year	Broodstock			Natural spawners	Percent removed	Fed fry released	Release size (gms)	Release date
	Males	Females	Total					
1999	2	2	4[1]	1	85.7	3880	10	4/8/00
2000	33	13	46	9	16.4	25900	10	4/20, 4/28/01

[1] Two additional females were trapped for brood stock, but could not be used because they were spawned out.

MONITORING AND EVALUATION

Fish marking and mark recovery - Brood years 1999 and 2000 were the first two years of the Jimmycomelately Creek supplementation program. The otoliths of summer chum salmon embryos produced in the program were thermally mass-marked (otolith-marked) prior to release as fry to distinguish them from naturally-spawned summer chum in JCL Creek and from fish reared in other summer chum supplementation programs. During 1999 and 2000, a permanent trap was operated throughout the summer chum return to enumerate spawners and to collect information on fish origin and age composition (see Section 2, Stock Assessment).

Adult returns - Beginning in 2001, examination of otoliths recovered from spawned adults will provide a method to separate the number of supplementation (hatchery) fish from the number of naturally spawning (wild) fish and/or strays from other supplementation programs and assist in determining the contribution of the supplementation program to the summer chum population.

Genetic and age sampling - The co-managers continued GSI allozyme and/or DNA collections of summer chum, including samples from JCL Creek during 1999 and 2000 (see Tables 5 and 6 in Stock Assessment section). Recent GSI samples have not yet been analyzed. Scales were also sample to age the fish (Tables 5, 6, 8 and 9).

Hatchery survival rates - The SCSCI and the HGMP prepared for the JCL Creek program establish survival rate objectives during incubation and rearing. The following survival rate objectives for each life stage are applied to all programs; these rates are used as criteria for measuring the effectiveness of each program:

Chum Life Stage	% Survival by Life Stage	Cum. % Survival from Green Egg
Green egg to eye-up	90.0	90.0
Eye-up to Swim-up	99.5	89.5
Swim-up to release	95.0	85.0

The JCL Creek summer chum program was generally successful in meeting the survival rate objectives. During brood year 1999, survival rates were 66% from green egg to eye-up and 95% from eye-up to swim-up at Hurd Creek Hatchery, and 99% for fry reared to release at the remote site (personal communication, T. Johnson, WDFW). It is presumed that poor viability of sperm and/or eggs from the earliest spawning summer chum contributed to the low green egg to eye-up survival rate; this has been observed in other summer chum programs as well. During 2000, survival rates were 95% from green egg to eye-up at Hurd Creek Hatchery, 98% from eyed egg to release for eyed eggs transferred to remote site on JCL Creek, and 99% from eyed egg to release for swim-up fry transferred to remote site on JCL Creek; cumulative survival from green egg to release was 94%..

Hatchery operations - Records of fish cultural techniques are regularly maintained and compiled. Summaries are available of protocols and procedures, temperature unit records by developmental

stage, ponding, feeding, rearing and release methods, production numbers, survival, size at release, and recommendations for facility or protocol improvements.

During 1999 and 2000, fry were successfully reared to the target average size of 1gram and were released during April into JCL Creek near the estuary. All fish released were otolith marked and two different otolith marks were applied at Hurd Creek Hatchery during 2000 to identify, upon return as adults, the group transferred as eyed eggs and the group transferred as swim-up fry.

Broodstocking and egg sources - To represent the demographics of the donor population, the intent is to use 100% of the summer chum returning to JCL Creek as broodstock. During BY 1999 and BY 2000, >85% of the summer chum returning to JCL Creek were included in the supplementation program; 1 and 9 summer chum spawned downstream of the trap during 1999 and 2000, respectively.

Fish health - Fish health was monitored by a WDFW fish health specialist in accordance with procedures in the co-managers disease control policy. During 1999 and 2000, summer chum broodstock were sampled for the incidence of viral pathogens, there was no significant mortality to unknown causes, recommendations on fish cultural practices were provided based on the fish health condition and implemented, and fish health condition of fry prior to release was good.

GENERAL PROGRAM ASSESSMENT

It appears that the JCL Creek summer chum supplementation program was generally successful in collecting a representative sample of brood stock from the natural JCL Creek summer chum population. Consistent with the standards set in the SCSCI and HGMP, the expected duration of the program is a maximum of 12 years (3 generations) beginning with brood year 1999. The co-managers will monitor the adult returns from fry released from the supplementation program.

The following outline describes how the Jimmycomelately supplementation project has addressed the program objectives described at the beginning of this Jimmycomelately project assessment.

Objective 1: Initiate a supplementation program using the indigenous JCL summer chum broodstock, thus retaining future options for recovery of the JCL population.
- Project has been successfully initiated (see Table 34).

Objective 2: Boost the numbers of naturally produced fish in JCL Creek using the indigenous population as the donor; develop and maintain, for 12 years (beginning in 1999), a population comprised of supplemented and naturally spawning fish using hatchery and wild-origin broodstock.
- Project has been in operation only two years; success of this objective can not yet be evaluated.

Objective 3: Monitor and evaluate, and annually report the effectiveness of the supplementation program, as measured by consistency with criteria set forth in the SCSCI.

- Monitoring and evaluation of the supplementation program is reported above in this Jimmycomelately project report. The project generally has been consistent with the aforementioned criteria.

5 - ECOLOGICAL INTERACTIONS

The SCSCI addressed two specific areas of potentially adverse effects on summer chum from ecological interactions: artificial production and marine mammal predation. Recommendations were made to address negative interactions associated with artificial production and there was acknowledgment that further study was needed to help identify possible future actions to mitigate predation impacts of marine mammals. Following are updates of progress in these two areas of concern.

HATCHERIES

The SCSCI assessed potential effects of existing hatchery programs upon summer chum in four categories: hatchery operations, predation, competition/behavior modification, and fish disease (SCSCI, section 3.3.2.1). Hatchery programs for individual salmonid species (other than summer chum) were rated as high, medium or low risk for designated hazards within each category. Those programs with hazards of high or medium risk were assigned specific risk aversion and monitoring/evaluation mitigation measures that if implemented would reduce the hazards to low risk.

Table 35 lists the existing hatchery programs within the summer chum Region and shows the specific risk aversion and monitoring/evaluation mitigation measures to be met by each program that was determined to have one or more hazards of high or medium risk (the table describes the mitigation measures in abbreviated form; expanded descriptions of the measures are provided in Appendix 4.1 and complete descriptions are available in section 3.3.2.1 of the SCSCI). The table duplicates Table 3.15 of the SCSCI, except that strikeouts now show the programs that have been discontinued. Also, Table 35 shows the status of implementing the mitigation measures in both 1999 and 2000 by the accompanying symbols (in bold font): **Y** = yes, measure(s) was implemented, **N** = no, measure(s) was not implemented, **Y/N** = partial implementation of the measure(s), or **NA** = not applicable. More explicit and detailed descriptions of the individual program's status in meeting the mitigation measures is provided in Appendix Report 3.

The majority of measures not being implemented or only partially being implemented are occurring with citizen group projects (Table 35) and are due primarily to project results not being reported by the operators and to how fish health monitoring has been done. There is some redundancy between hazard categories (e.g., recording and reporting of fish production information is stipulated under both the categories of Hatchery Operations and Predation). To address poor reporting of project results, WDFW plans to include in future annual contracts with project operators (that fall within the citizen group classification of Table 35), language requiring a timely fish production report at the risk of project termination. Currently, WDFW does not routinely monitor fish health during the rearing of juvenile fish by citizen group projects (the exception is for summer chum projects), and there is no pre-release health certification. However, the WDFW pathologists do respond to any requests or concerns

expressed about fish health by the project operators. It is assumed that there is low risk of unmonitored fish disease incidents with this approach; however, this approach does not fully meet the specified measures addressing fish health in the hazard categories and, therefore, only partial implementation is indicated in Table 35. Project-specific information regarding the mitigation measures is provided in Appendix Report 3.

Table 35. Summary description for the years 1999 and 2000 of Risk Aversion (r.a.) And Monitoring and Evaluation measures planned for artificial propagation programs in the Hood Canal summer chum region. Abbreviations "Y", "N", or "Y/N" shown in parentheses next to each measure indicate: "yes", the measure was implemented, "no" the measure was not implemented, or "yes and no" the measure was partially implemented (see specific comments in Appendix Report 3). "NA" means the measure was not applicable. Strike-outs indicate the project was discontinued.

		Hazard Categories and Assigned Risk (criteria # from risk ranking within category applied)[1]				
Agency	*Species* Project	Release class	Hatchery Operations	Predation	Competition and Behavior Modification	Disease Transfer
	Fall Chinook					
WDFW	Hoodsport FH	Fingerling	—	—	—	—
	George Adams FH	Fingerling	—	—	—	—
	~~Sund Rock Net Pens~~	~~Yearling~~	—	—	~~r.a. #7, m&e#1~~	—
Skokomish Tribe	~~Enctai~~	~~Fingerling~~	—	—	~~m&e#1~~	—
Port Gamble Tribe	~~Little Boston~~	~~Fingerling~~	—	—	—	—
Citizen Groups	~~Union River~~	~~Fingerling~~	~~m&e#3-5~~	~~m&e#1~~	~~r.a.#4, m&e#1, 2~~	~~r.a.#4, m&e#1, 2~~
	~~Tahuya River~~	~~Fingerling~~	~~m&e#3-5~~	~~m&e#1~~	~~r.a.#4, m&e#1, 2~~	~~r.a.#4, m&e#1, 2~~
		~~Unfed fry~~	~~m&e#3-5~~	~~m&e#1~~	~~r.a.#4, m&e#1, 2~~	~~r.a.#4, m&e#1, 2~~
	~~Dewatto River~~	~~Fingerling~~	~~m&e#3-5~~	~~m&e#1~~	~~r.a.#4, m&e#1, 2~~	~~r.a.#4, m&e#1, 2~~
	Big Beef Creek	Fingerling	m&e#3 (Y-N), 4 (N), 5 (NA)	m&e#1 (N)	r.a.#4 (N); m&e#1 (Y)	r.a. #1-4 (Y/N), 2, 4 (Y), 3 (N), m&e1 (Y/N), 2 (Y)
	Skokomish River	Yearling	m&e#3 (Y)	m&e#1 (N)	m&e#1 (y)	m&e1 (Y), 2 (Y)
		Fingerling	4 (N), 5 (NA) m&e #3	m&e#1 (N)	m&e#1 (Y)	m&e1 (Y/N), 2 (Y)
	Hamma Hamma River	Fingerling	(Y/N), 4 (N), 5 (NA) r.a.#4 (Y), #6 (Y);	m&e#1 (N)	m&e#1 (Y)	m&e1 (Y/N), 2 (Y)
	Johnson Creek (Duckabush)	Fingerling	m&e#1 2, (Y), 3 (Y/N)	m&e#1 (N)	m&e#1 (Y)	r.a.#1 (Y/N), 2, 4 (Y), 3 (N); m&e1 (Y/N), 2 (Y)
		~~Unfed fry~~	4 (n), 5 (NA)	~~m&e#1~~	~~m&e#1, 2~~	~~r.a.#1-4, m&e 1,2~~
	~~Unnamed tribs: Pleasant Harbor Net Pens~~	~~Yearling~~	m&e#3 (Y/N), 4 (N), 5 (NA)	~~m&e#1~~	~~r.a.#7, m&e#1~~	~~m&e1,2~~
		~~Yearling~~		~~m&e#1~~	~~r.a.#7, m&e#1~~	~~m&e 1,2~~
	~~HC Marina Net Pens~~		~~m&e#3-5~~ ~~m&e#3-5~~ ~~m&e#3-5~~			

Table 35. Continued

Agency	Species / Project	Release class	Hatchery Operations	Predation	Competition and Behavior Modification	Disease Transfer
		Hazard Categories and Assigned Risk (criteria # from risk ranking within category applied)[1]				
	Chinook					
WDFW	Dungeness FH	Fry	—	m&e#2 (Y)	—	—
		Fingerling	—	m&e#2 (Y)	—	—
		Fingerling smolt	—	—	—	—
	Coho					
WDFW	Dungeness FH	Yearling	—	—	—	—
	Pt. Gamble Net pens	Yearling	—	—	r.a. #7 (Y)	—
	Quilcene Net pens	Yearling	—	—	r.a#7 (Y)	—
	George Adams FH	Yearling	—	—	—	—
	Tarboo Creek	Fingerling	—	—	—	—
	Snow Creek	Unfed fry	—	m&e#2 (Y)	m&e#3 (Y)	—
		Presmolts	—	m&e#2 (Y)	m&e#3 (Y)	—
USFWS	Quilcene NFS	Yearling	—	—	—	—
		Fingerling	—	r,a#2, 3	—	—
	Pink					
WDFW	Hoodsport FH	Fed fry	—	r.a.#4 (Y)	r.a.#1, 2 (Y)	—
	Dungeness FH	Fed fry	r.a.#1-5 (NA)	—	r.a.#6 (Y)	—
	Fall Chum					
WDFW	Hoodsport FH	Fed fry	—	r.a.#4 (Y)	r.a.#1, 2 (Y)	—
	George Adams FH	Fed fry	—	—	—	—
	McKennan FH	Fed fry	—	r.a.#4 (Y)	r.a.#1, 2 (Y)	—
Skokomish Tribe	Enctai	Fed fry	—	—	—	—
Pt. Gamble Tribes	Port Gamble FH	Fed fry	—	—	—	—
USFWS	Quilcene NFH	Fed fry	—	—	—	—
Citizen Groups	~~Mills Creek~~	~~Unfed fry~~	~~m&e#3-5~~	~~m&e#1~~	~~r.a.#3, m&e#1-2~~	~~r.a.#1; m&e#1,2~~
	~~Tahuya River~~	~~Unfed fry~~	~~m&e#3-5~~	~~r.a.#4, m&e#1~~	~~r.a.#3, m&e#1-2~~	~~r.a.#1; m&e#1,2~~
	~~Union River~~	~~Unfed fry~~	~~m&e#3-5~~	~~r.a.#4, m&e#1~~	~~r.a.#2, 3; m&e#2~~	~~r.a.#1; m&e#1,2~~
	~~L. Mission Creek~~	~~Unfed fry~~	~~m&e#3-5~~	~~m&e#1~~	~~r.a.#2, m&e#2~~	~~r.a.#1; m&e#1,2~~
	~~Skull Creek~~	~~Unfed fry~~	~~m&e#3-5~~	~~m&e#1~~	~~r.a.#2; m&e#2~~	~~r.a.#1; m&e#1,2~~
	Sweetwater Creek	Unfed fry	m&e#3 (Y/N), 4 (N), 5 (NA)	m&e#1 (N)	r.a.#2; m&e#2 (Y)	r.a.#1 (Y/N), 2,4 (Y) 3 (N); m&e1 (Y/N), 2 (Y)
	Unnamed 14.0124 (Grimm)	Unfed fry	m&e#3 (Y/N), 4 (N), 5 (NA)	m&e#1 (N)	r.a.#2; m&e#2 (Y)	r.a.#1 (Y/N), 2,4 (Y) 3 (N); m&e1 (Y/N), 2 (Y)
	~~Chinom Pt. (Ck)~~	~~Unfed fry~~	~~m&e#3-5~~	~~m&e#1~~	~~r.a.#2;m&e#2~~	~~r.a.#1-4; m&e 1,2~~
	Unnamed 12.0136 (Adams)	Unfed fry	m&e#3-5	m&e#1 (N)	r.a.#2; m&e#2 (Y)	r.a.#1 (Y/N), 2,4 (Y) 3 (N); m&e1 (Y/N), 2 (Y)
	~~Skokomish River~~	~~Unfed fry~~	m&e#3-5	~~r.a.#4; m&e~~#1	~~r.a.#2; m&e#2~~	~~r.a.#1-4; m&e 1,2~~
	~~Jump-off Joe Creek~~	~~Unfed fry~~		~~m&e#1~~	~~r.a.#2; m&e#2~~	~~r.a.#1-4; m&e 1,2~~
	Unnamed 14.0124 (Koopman/Mulberg)	Unfed fry	~~m&e#3-5~~ ~~m&e#3-5~~ m&e#3 (Y/N, 4 (N), 5 (NA)	m&e #1 (N)	r.a.#2; m&e#2 (Y)	r.a.#1 (Y/N), 2, 4 (Y), 3 (N); m&e 1 (Y/N) 2 (Y)

(Table continues on next page)

Table 35. Continued

Agency	*Species* Project	Release class	Hatchery Operations	Predation	Competition and Behavior Modification	Disease Transfer
		Hazard Categories and Assigned Risk (criteria # from risk ranking within category applied)[1]				
	Steelhead					
WDFW	Skokomish River	Yearling	—	r.a.#1-3 (Y)	—	—
	Dosewallips River	Yearling	—	r.a.#1,2 (Y), 3 (Y/N)	—	—
	Duckabush River	Yearling	—		—	—
	Dungeness FH	Yearling	—	r.a.#1,2 (Y), 3 (Y/N) r.a.#1-3 (Y)	—	—
Citizen Groups	Hamma Hamma R.	2+ Yearl.	r.a.#4, 6 (Y); m&e#1,3 (Y/N), 2,4 (Y), 5 (NA)	r.a.#1,2 (Y/N), 3 (Y); m&e#1 (Y)	m&e#3 (NA)	m&e#1 (Y/N), 2 (Y)

[1] Risk aversion ("r.a.") and monitoring and evaluation ("m&e") measures indicated as required for each project are keyed by number to measure applicable to each hazard described in section 3.3.2.1 of the Summer Chum Salmon Conservation Initiative.

MARINE MAMMALS

The WDFW has been evaluating potentially adverse effects of predation by pinnipeds on summer chum in Hood Canal since late 1998. These efforts have progressed through 2000 and may extend into future years if funding is made available. Appendix Report 4 contains a brief report of preliminary results from 1998 and 1999. (A more detailed description of study results for 1998 and 1999 is available in a technical report [Jeffries et al. 2000] and a progress report on the study for year 2000 is in preparation).

The study estimated total numbers of summer chum killed by harbor seals. However, it was not possible to reliably distinguish observed salmon predations by individual species. So, proportional allocation based on relative abundances of all salmon species present was applied to estimate numbers of summer chum killed. It was assumed no selection by harbor seals for or against summer chum occurred relative to other salmon species; the proportion of estimated summer chum abundance relative to estimated total salmon abundance was therefore used to allocate the number of predations on summer chum. The study results showed that a small number of harbor seals (two to six individuals in the lower reaches and estuary of a river) are killing hundreds of summer chum annually. Seal predation estimates ranged from 2 to 29 percent of the summer chum in each river. The results suggest that seal predation may be significant in some years. The Co-managers plan to initiate discussion with the National Marine Fisheries Service about possible seal management actions and the need for additional study.

6 - HABITAT

The ESA listing of summer chum as a threatened species is expected to help motivate movement toward effective habitat protection and restoration measures. Section 3.4 of the SCSCI provides guidance and direction to pursuit of such measures with 1) a habitat limiting factors analysis of the summer chum watersheds and sub-estuaries, 2) descriptions of habitat protection and restoration strategies, 3) recommendations for monitoring and research, and 4) a discussion of implementation focusing on what participants and their roles are needed for effective habitat protection and improvement. Appendix Report 3.6 of the SCSCI provides detailed information on the results of the limiting factors analysis and recommendations for recovery specific to individual watersheds. It is understood that actions involving land use management and regulation, as well as restoration, can require a wide range of participants and processes, and will take time to implement. Also, the scale of needed improvements is much larger than can be reasonably accomplished within the time span of a year or even several years. Continuing long term efforts and commitments will be necessary to adequately protect and recover the summer chum. The following list describes some of the actions and processes now under way that are intended to benefit summer chum and other species.

- The Washington Department of Ecology issued the new state shoreline management rule at the end of last year. The rule provides two pathways that counties may take to implement their shoreline management plans - one that NMFS is expected to recognize as compliant with ESA listing requirements and another that is less restrictive and may put a county at risk of non-compliance with ESA (the ESA-compliant path generally provides improved habitat protection over current regulations). Jefferson and Kitsap counties (both within the Hood Canal and Strait summer chum region) initiated efforts to develop new shoreline master programs, but uncertainty about future legislative challenges to the state rule and local opposition to more restrictive limitations on shoreline development extended the time frame for completion of the master programs. The outcomes are uncertain at this time.

- Jefferson County prepared a new Uniform Development Code under the Growth Management Act that addressed some needed land use management revisions (e.g., increased setback buffers for streams and wetlands, and regulation of clearing and grading); however, it did not deal effectively with other areas of potential improvement (e.g., in the way use of Best Available Science was addressed).

- Clallam County upgraded its Critical Areas Ordinance in 1999, providing limited improvements on the previous ordinance. Recently the new ordinance was challenged in front of the Growth Management Hearings Board by several conservation groups; some modifications were made but most of the challenges were struck down.

- Kitsap County pursued development of a salmon plan intended to provide an exemption for county land use programs under the ESA 4(d) rule. The plan was initially comprehensive and in many ways consistent with recommendations of the SCSCI. However, plan provisions were softened (e.g., stream and shoreline buffer standards have been reduced) in response to political pressures. Work on the salmon plan continues but the outcome is uncertain at this time.

- A number of new projects and studies addressing salmon restoration have been funded by the State's Salmon Recovery Funding Board, the project selection being implemented through local lead entities. Projects of potential benefit to summer chum salmon include acquisition of shoreline in Stavis Bay as a nearshore reserve, acquisition of land at the mouth of Jimmycomelately Creek needed to relocate the stream and restore habitat in its lower reaches and estuary, obtained funding for acquisition of land for stream habitat restoration on Salmon Creek and for implementation of designed project (to begin next year), acquisition of land and implementation of estuarine habitat improvements at the mouth of Chimacum Creek in Port Townsend Bay, a study to evaluate Highway 101 causeway effects on sub-estuarine environments in southwest Hood Canal (including the Skokomish, Lilliwaup, Hamma Hamma, Duckabush and Dosewallips sub-estuaries), and restoration of estuarine habitat in Quilcene Bay near Indian George Creek.

- Several other studies are being implemented or planned to provide better information upon which more effective protection and restoration efforts may be built. These include inventory of the Dosewallips River's mainstem habitat, inventory of shoreline development in Hood Canal and the eastern Strait, assessment of Hood Canal nearshore eelgrass habitat relative to shoreline development, recovery and utilization of 19th century U.S. Coast and Geodetic Survey maps to show historical shoreline configurations, inventory of forage fish spawning areas, and cooperative inter-agency beach seine sampling of juvenile salmonids in the estuaries to learn more about distribution and life history.

7 - CONCLUDING REMARKS

The Co-managers generally have been successful in implementing the components of the SCSCI over which they have jurisdiction (including artificial production, ecological interactions and harvest management). Progress is also being made in addressing summer chum salmon habitat needs (outside the Co-managers jurisdiction). Following are brief summaries of progress in the implementation of the SCSCI within the major management categories.

STOCK ASSESSMENT

The collection of necessary data to generate quality estimates of summer chum escapement and runsize was continued by the Co-managers. A comprehensive schedule of spawning ground counts was conducted on all summer chum streams, and detail of the spawning escapement counts for each stock during 1999 and 2000 are provided in Appendix Report 1. The combination of escapement estimates and sport and net harvests resulted in reliable estimates of runsize, which were generated using the summer chum run re-construction model.

Biological sampling was conducted on all summer chum stocks, including mark sampling (both fin clips and otolith marks), age sampling (scales), and genetic stock identification (both DNA and allozyme). This sampling was of dead fish or post spawners including those broodstock collected for supplementation programs. This conservative approach to sampling frequently resulted in situations where only small numbers of fish were available for sampling, causing sample sizes to be very small (see Tables 5-9). In the future, genetic samples may have to be pooled for several stocks or collected over a number of years to achieve significant measurements.

An up-dated extinction risk assessment was conducted using summer chum census data through the 2000 return. The risk assessment followed the methods presented in SCSCI section 1.7.4 (from Allendorf et al. 1997). The new assessment continued to identify the Jimmycomelately and Lilliwaup stocks to be at a high risk of extinction. All other extant summer chum stocks were at a moderate or low risk of extinction.

HARVEST MANAGEMENT

The harvest management actions implemented under the SCSCI Base Conservation Regime continue to successfully achieve the plan goal of minimizing harvests of summer chum salmon. As shown in Table 13 above, the fishery exploitation rates in both 1999 and 2000 were below the BCR target rates in all management units. The primary result of these low rates of fishery harvest is that the escapements of summer chum stocks are generally exceeding 90% of the estimated runsizes. Biological sampling of the summer chum harvested, however, could not be conducted because of the low numbers of fish landed.

ARTIFICIAL PRODUCTION

Artificial production (hatchery) techniques may be used to supplement currently depressed wild summer chum stocks or to reintroduce summer chum into streams where the original population no longer exists. When properly implemented, supplementation and reintroduction can be powerful tools which, in combination with harvest and habitat management actions, can contribute to the recovery or restoration of naturally-producing populations. As described in section 3.2 of the SCSCI, the intent of supplementation of summer chum in the Hood Canal region is to reduce the short term extinction risk to summer chum populations and to increase the likelihood of their recovery.

Generally, the summer chum salmon supplementation and reintroduction programs have been successful in meeting the operational criteria/standards and program objectives described in the SCSCI. The individual project reports contained in the body of the report describe in detail how the criteria/standards and objectives are being met (see section 4).

ECOLOGICAL INTERACTIONS

The co-managers have generally been successful in implementing the provisions addressing risk to summer chum salmon of interactions with hatchery fish (Table 35). A problem that has surfaced regarding poor reporting of results for citizen group hatchery projects is being addressed by WDFW and is expected to be remedied in the future. A WDFW study of seal predation on salmon in summer chum salmon streams suggests that seal predation may be at significant levels in some years. The co-managers plan to initiate discussion with the National Marine Fisheries Service about possible seal management actions and the need for additional study.

HABITAT

A number of restoration projects and studies specifically addressing or related to the protection and restoration of summer chum salmon are being or soon will be implemented. Improvements in land use management to the benefit of summer chum salmon and other natural resources are also being considered. Establishing effective protection and restoration measures will take time. Staff of the co-managers are continuing to participate in various planning processes that affect selection of restoration projects and studies, and work toward improving land use management practices. Part of this co-manager activity is providing assistance in interpreting provisions of the SCSCI and in understanding the habitat needs of summer chum.

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APPENDIX

TABLES

Appendix Table 1. Summer chum salmon spawning escapement estimates in the Hood Canal region (1968-2000).

Appendix Table 2. Summer chum salmon spawning escapement estimates in the Strait of Juan de Fuca region (1968-2000).

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Appendix Report 3 - Status of Artificial Production Programs in Meeting Specified Mitigation Measures to Reduce Risk of Negative Interactions with Summer Chum Salmon

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Appendix Table 1. Summer chum salmon escapement estimates in the Hood Canal region (1968-2000). *(Excluded values = missing estimates; Italicized = estimates based on regression or extrapolation. In broodstock columns excluded values mean no broodstock collected).*

					Union			Lilliwaup			Hamma Hamma					Big/Little Quilcene			
Return Year	Big Beef	Anderson	Dewatto	Tahuya	Wild	Brdstk	Total	Wild	Brdstk	Total	Wild	Brdstk	Total	Duckabush	Dosewallips	Big Quil	Little Quil	Brdstk	Total
1968	100		2,275								13,548			4,693		5,797	897		6,694
1969	100		280								3,104			3,802		1,307			
1970	178	65	2,666								1,390			2,301		655	12		667
1971	159	125	2,012					318			4,282			3,904		1,798	71		1,869
1972	177	225	1,403	4,487				716			5,346			13,546	1,733	2,067	300		2,367
1973	244		691											5,761	623	3,107	238		3,345
1974	75	0	181	880	68		68	616			***2,448***			3,581	***3,593***	795	44		839
1975	1,152	195	613	1,389	***84***		***84***	706			***7,341***			2,245	***2,250***	1,405	868		2,273
1976	1,281	234	741	3,200	100		100	1,612			***7,648***			6,095	3,271	2,445	1,088		3,533
1977	302	***26***	225	726	75		75	420			***1,675***			2,453	3,215	821	773		1,594
1978	680	16	544	266	35		35	1,331			***8,215***			1,898	***1,901***	2,978	1,816		4,794
1979	191	6	49	117	***90***		***90***	163			***3,096***			1,190	***1,190***	345	110		455
1980	123	2	117	179	208		208	247			329			827	1,216	375	154		529
1981	90	1	41	140	41		41	293			926			557	63	138	84		222
1982	0	***0***	21	86	***153***		***153***	84			801			690	507	156	125		281
1983	0	0	15	86	170		170	18			190			80	64	64	176		240
1984	22	1	44	142	194		194	187			***170***			299	212	60	83		143
1985	0	0	19	122	334		334	92			***231***			30	236	44	1		45
1986	0	0	20	109	1,892		1,892	97			173			177	57	15	12		27
1987	6	0	5	91	497		497	32			26			12	9	8	71		79
1988	0	0	23	145	629		629	275			440			497	661	120	177		297
1989	0	0	2	9	450		450	43			16			60	16	1	1		2
1990	0	0	0	6	275		275	2			90			42	8	6	0		6
1991	0	0	31	5	208		208	30			69			102	250	49	1		50
1992	0	0	0	0	140		140	81	18	99	123			617	655	320	9	414	743
1993	0	0	1	0	251		251	67	10	77	69			105	105	97	12	39	148
1994	0	0	0	0	738		738	99	12	111	370			263	225	349	0	373	722
1995	0	0	0	0	721		721	79	0	79	476			825	2,787	4,029	54	491	4,574
1996	0	0	0	5	494		494	64	12	76	774			2,650	6,976	8,479	265	771	9,515
1997	0	0	6	0	410		410	9	18	27	104			475	47	7,339	29	535	7,903
1998	0	0	12	0	223		223	3	21	24	111			226	336	2,244	265	548	3,057
1999	4	0	2	1	159		159	0	13	13	212	43	255	92	351	2,981	84	172	3,237
2000	20	0	10	2	682	62	744	2	20	22	173	56	229	464	1,260	5,126	268	504	5,898

Appendix Table 2. Summer chum salmon escapement estimates in the Strait of Juan de Fuca region (1968-2000). *(Excluded values = missing estimates; Italicized = estimates based on regression or extrapolation. In broodstock columns excluded values mean no broodstock collected).*

Return Year	Jimmycomelately			Snow	Salmon			Chimacum
	Wild	Broodstock	Total		Wild	Broodstock	Total	
1968								
1969								
1970								
1971					249		249	
1972				436	534		534	
1973					636		636	
1974	***438***		***438***	818	512		512	
1975	***348***		***348***	327	755		755	
1976	***365***		***365***	608	521		521	
1977	***405***		***405***	538	701		701	
1978	***787***		***787***	629	1,664		1,664	
1979	***170***		***170***	133	458		458	
1980	***1,326***		***1,326***	709	3,074		3,074	
1981	***203***		***203***	242	439		439	
1982	599		599	766	1,386		1,386	
1983	254		254	154	731		731	
1984	367		367	384	828		828	
1985	61		61	20	151		151	
1986	292		292	213	582		582	
1987	464		464	465	1,062		1,062	
1988	1,052		1,052	723	1,915		1,915	
1989	173		173	21	194		194	
1990	63		63	33	245		245	
1991	125		125	12	172		172	
1992	616		616	21	371	62	433	
1993	110		110	11	400	52	452	
1994	15		15	2	137	24	161	
1995	223		223	25	538	53	591	
1996	30		30	160	785	109	894	
1997	61		61	67	724	110	834	
1998	98		98	27	1,023	121	1,144	
1999	1	6	7	29	434	65	499	38

APPENDIX REPORT 1

DERIVATION OF ESCAPEMENT ESTIMATES FOR THE 1999 AND 2000 RETURNS OF SUMMER CHUM SALMON TO THE STREAMS OF HOOD CANAL AND THE STRAIT OF JUAN DE FUCA

Escapement estimates for Hood Canal and Strait of Juan de Fuca summer chum populations are based upon the collection and analysis of multiple live and dead fish counts made in each stream throughout the spawning season. An estimate of the total abundance of summer chum in each stream from this data is made by use of an "area-under-the-curve" (AUC) methodology. The AUC escapement methodology is based upon escapement curves developed from serial spawner counts, which are converted into total escapement estimates for the surveyed stream using the average chum salmon spawner residence life. Other methods, such as rack and redd counts were also used where available and/or appropriate. For a more detailed discussion see SCSCI Appendix Report 1.1.

The following are the 1999 and 2000 return year summaries of the summer chum escapements, quality ratings and the spawner count data used for estimating escapement. Survey data directly used in estimation process is highlighted with **bold text** in the annual summary tables.

1999 Summer Chum Natural Spawning Escapement Summary

Big Beef Creek (WRIA 15.0389)

Summer 1999

Reach	**River mile 0.0 upstream**
Estimate	0
Method	Trap count (broodstock take adjustment)
Quality rating	Very good
Comments	Trap operated continuously by UW and WDFW from September 1 through October, 1999. Four jacks were captured in trap.

Anderson Creek (WRIA 15.0412)

Summer 1999

Reach	**River mile 0.0-1.0**
Estimate	0
Method	See comments.
Quality rating	Very good
Comments	Assumed escapement was zero due apparent extirpation of the population, and no fish observed in 6 survey observations from Sept. 2 to Oct. 18. Assumed the 3 fish observed on Oct. 25 were early fall chum.

Table 1.1. Anderson Creek 1999 chum survey data through Oct. 25.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Type Survey	Method	Other Species				Comments			Agency
15 0412	**09/02/99**	**0.0**	**1.0**	**1.0**	**0**	**0**	**0**	**95**	**INDX**	**FOOT**	**0**	**0**	**0**	**0**	**20**	**60**		WDFW
15 0412	**09/09/99**	**0.0**	**1.0**	**1.0**	**0**	**0**	**0**	**95**	**INDX**	**FOOT**	**0**	**0**	**0**	**0**	**20**	**60**		WDFW
15 0412	**09/21/99**	**0.0**	**1.0**	**1.0**	**0**	**0**	**0**	**95**	**INDX**	**FOOT**	**0**	**0**	**0**	**0**	**20**	**60**		WDFW
15 0412	**10/04/99**	**0.0**	**1.0**	**1.0**	**0**	**0**	**0**	**95**	**INDX**	**FOOT**	**0**	**0**	**0**	**0**	**20**	**60**		WDFW
15 0412	**10/11/99**	**0.0**	**1.0**	**1.0**	**0**	**0**	**0**	**95**	**INDX**	**FOOT**	**4**	**7**	**0**	**0**	**20**	**60**	**61**	WDFW
15 0412	**10/18/99**	**0.0**	**1.0**	**1.0**	**0**	**0**	**0**	**95**	**INDX**	**FOOT**	**1**	**3**	**4**	**0**	**20**	**60**	**61**	WDFW
15 0412	10/25/99	0.0	1.0	1.0	0	0	0	95	INDX	FOOT	4	8	0	0	20	60		WDFW

Notes:
Sept. 2 survey card noted 3 beaver dams: a) 50 yards from survey split point, b) 200 yards from bottom bridge (RM 0.1), and c) below bottom bridge. Surveyors notched the dams.
Sept. 9 - Dam by mouth was repaired, but passable to fish. The dam 200 yards up from the highway bridge is a block (4 ft. high from base).
Sept. 21 - Lower dam was still passable, but upper two dams were re-built.
Oct. 18 - Dams were still a problem. There were chinook, pink, and coho observed in the stream, all below the highway bridge.
Oct. 25 – Dams were notched again. All fish (3) below highway bridge.
Nov. 1 - Beaver dam by bridge was a block again. All the chums (28) were below the lower dam.

Dewatto River (WRIA 15.0420)

Summer 1999

Reach	**River mile 0.3-1.8**
Estimate	2
Method	Live + dead Sept. 21 survey.
Quality rating	Good
Comments	Assumed the 2 live fish observed on Oct. 18 were early fall chum.

Table 1.2. Dewatto River 1999 chum survey data through Oct. 25.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Type Survey	Method	Other Species				Comments			Agency
15 0420	09/02/99	0.3	1.8	1.5	0	0	0	95	INDX	FOOT	1	3	7	0	20			WDFW
15 0420	09/09/99	0.3	1.8	1.5	0	0	0	95	INDX	FOOT	1	0	0	0	20			WDFW
15 0420	**09/21/99**	**0.3**	**0.9**	**0.6**	**0**	**0**	**0**	**95**	**INDX**	**FOOT**	**1**	**7**	**0**	**0**	**20**	**60**	**61**	WDFW
15 0420	**09/21/99**	**0.9**	**1.8**	**0.9**	**2**	**0**	**2**	**95**	**INDX**	**FOOT**	**1**	**7**	**0**	**0**	**20**	**60**	**61**	WDFW
15 0420	10/04/99	0.3	1.8	1.5	0	0	0	95	INDX	FOOT	1	4	7	0	20			WDFW
15 0420	10/11/99	0.3	1.8	1.5	0	0	0	95	INDX	FOOT	1	4	7	0	20			WDFW
15 0420	10/18/99	0.9	0.9	0.6	2	0	2	95	INDX	FOOT	1	4	7	0	20	61		WDFW
15 0420	10/18/99	0.3	1.8	0.9	0	0	0	95	INDX	FOOT	1	4	7	0	20	61		WDFW
15 0420	10/25/99	0.3	0.9	0.6	13	5	18	90	INDX	FOOT	4	8	0	21	60	61		WDFW
15 0420	10/25/99	0.9	1.8	0.9	0	1	1	90	INDX	FOOT	4	8	0	21	60	61		WDFW

Notes:
Sept. 21 survey card noted an active redd in the upper survey section.
Oct. 25 - All live fish in delta.

Tahuya River (WRIA 15.0446)

Summer 1999

Reach	**River mile 0.0-2.6**
Estimate	1
Method	Live + dead Sept.9, Oct. 4 and 11 survey
Quality rating	Fair
Comments	Only gave a “fair” rating due to large 25 day gap between Sept. 9 and Oct. 4 surveys. There were minimal parent escapements, so run should have been minimal/non-existent.

Table 1.3. Tahuya River 1999 chum survey data through Oct. 25.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Type Survey	Method	Other Species				Comments			Agency
15 0446	09/02/99	0.0	2.6	2.6	0	0	0	95	INDX	FOOT	3	4	7	0	20			WDFW
15 0446	**09/09/99**	**0.0**	**2.6**	**2.6**	**0**	**0**	**0**	**90**	**INDX**	**FOOT**	**7**	**0**	**0**	**0**	**20**			WDFW
15 0446	**10/04/99**	**0.2**	**2.6**	**2.4**	**0**	**0**	**0**	**95**	**INDX**	**FOOT**	**1**	**4**	**7**	**0**	**20**			WDFW
15 0446	**10/11/99**	**0.0**	**2.6**	**2.6**	**1**	**0**	**1**	**95**	**INDX**	**FOOT**	**4**	**7**	**0**	**0**	**20**	**60**	**61**	WDFW
15 0446	10/18/99	0.0	2.6	2.6	0	0	0	95	INDX	FOOT	4	7	0	0	20	60		WDFW
15 0446	10/25/99	0.0	2.6	2.6	31	0	31	95	INDX	FOOT	4	7	0	0	20	60	61	WDFW

Notes:
Oct. 11 – Fish observed was in lower section of survey reach.
Oct. 25 – All fish observed in lower section of survey reach.

Union River (WRIA 15.0503)

Summer 1999

Reach	**River mile 0.3-2.1**
Estimate	159
Method	AUC - 10 day stream life
Quality rating	Very Good
Comments	Slight ambiguity about concluding point of run. Assumed live observed on Oct. 12 survey were the last summer chum.

Table 1.4. Union River 1999 chum survey data through Oct. 26.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Type Survey	Method	Other Species				Comments			Agency
15 0503	**08/24/99**	**0.3**	**2.1**	**1.8**	**12**	**0**	**12**	**90**	**INDX**	**FOOT**	**1**	**8**	**0**	**0**	**20**	**61**		WDFW
15 0503	**09/01/99**	**0.3**	**2.1**	**1.8**	**33**	**0**	**33**	**99**	**INDX**	**FOOT**	**1**	**0**	**0**	**0**	**20**	**60**	**61**	WDFW
15 0503	**09/08/99**	**0.3**	**2.1**	**1.8**	**54**	**2**	**56**	**90**	**INDX**	**FOOT**	**1**	**7**	**0**	**0**	**21**	**60**	**61**	WDFW
15 0503	**09/14/99**	**0.3**	**2.1**	**1.8**	**85**	**6**	**91**	**95**	**INDX**	**FOOT**	**1**	**7**	**1**	**0**	**20**	**60**	**61**	WDFW
15 0503	**08/24/99**	**0.3**	**2.1**	**1.8**	**9**	**13**	**22**	**95**	**INDX**	**FOOT**	**1**	**0**	**1**	**0**	**20**	**60**	**61**	WDFW
15 0503	**10/05/99**	**0.3**	**2.1**	**1.8**	**1**	**5**	**6**	**90**	**INDX**	**FOOT**	**1**	**4**	**0**	**0**	**24**	**60**	**61**	WDFW
15 0503	**10/12/99**	**0.3**	**2.1**	**1.8**	**3**	**2**	**5**	**90**	**INDX**	**FOOT**	**1**	**7**	**0**	**0**	**21**	**60**	**61**	WDFW
15 0503	10/18/99	0.3	2.1	1.8	3	2	5	90	INDX	FOOT	1	4	0	0	20	61		WDFW
15 0503	10/26/99	0.3	2.1	1.8	37	0	37	90	INDX	FOOT	1	7	0	0	21	60	61	WDFW

Notes:
Sept. 1 : Upper section 3 redds (1 active), lower section 4 redds (all active)
Sept. 8 : Upper section 7 active redds, lower section 4 active redds.
Sept. 14 : Upper section 8 active redds, lower section 15 active redds.
Sept. 24 : Upper section 5 active redds, lower section 1 active redd.

Lilliwaup Creek (WRIA 16.0230)

Summer 1999

Reach	**River mile 0.0-0.7**
Estimate	0
Method	Broodstock weir was assumed fish-tight all season.
Quality rating	Very Good
Comments	Thirteen fish (7 males, 6 females) were captured at the weir and spawned in the supplementation program.

Hamma Hamma River (WRIA 16.0251)

Summer 1999

Reach	**River mile 0.3-1.8**
Estimate	212
Method	AUC - 10 day stream life (broodstock take adjustment)
Quality rating	Good
Comments	Curve well defined by data. Broodstock take adjustment issue has some ambiguity as to accuracy of method used to account for fish that are counted in surveys and then removed by broodstocking operations. Some ambiguity in endpoint of curve, due to apparent fall fish entry overlap. Survey counts are considered conservative due to the large number of chinook present in stream – pooled chum counts were difficult in early to mid-season because of the large number of fish of different species (pinks, chums, coho, and chinook) mixed together in the pools. Surveyors subjectively felt the stream life was longer-than-average this year, which is possible because flows were rather high and cold for a long period in early to mid-season due to the high snow-pack. A total of 43 fish (21 males, 22 females) removed for broodstock. Adjusted escapement = [(2,332 FD – (43 broodstock x 5 days assumed avg. residence before removal)) / 10 day stream life] One snorkel survey was conducted by the broodstock collection program staff. This data was not used in the escapement estimate, since the technique is so different in viewing capabilities compared with “above water” survey methods.

Table 1.5. Hamma Hamma River 1999 chum survey data through Nov. 2 .

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Type Survey	Method	Other Species				Comments			Agency
16 0251	**08/19/99**	**0.3**	**1.8**	**1.5**	**0**	**0**	**0**	**70**	**INDX**	**RAFT**	**1**	**3**			**24**	**60**		WDFW
16 0251	**08/27/99**	**0.3**	**1.8**	**1.5**	**8**	**0**	**8**	**85**	**INDX**	**RAFT**	**1**	**3**			**24**	**60**		WDFW
16 0251	**09/10/99**	**0.3**	**1.8**	**1.5**	**42**	**01**	**42**	**85**	**INDX**	**RAFT**	**1**	**3**			**21**	**60**		WDFW
16 0251	**09/20/99**	**0.3**	**1.8**	**1.5**	**71**	**3**	**74**	**80**	**INDX**	**RAFT**	**1**	**3**	**4**		**20**	**60**		WDFW
16 0251	09/22/99	0.3	1.8	1.5	40	NC	40	90	SUPP	SNKL	1	4	6		20			WDFW
16 0251	09/22/99	1.8	2.2	0.4	0	0	0	90	SUPP	SNKL	1	3	4	6	20			WDFW
16 0251	**09/29/99**	**0.3**	**1.8**	**1.5**	**58**	**3**	**61**	**90**	**INDX**	**RAFT**	**1**	**3**	**4**	**6**	**20**	**60**		WDFW
16 0251	**10/07/99**	**0.3**	**1.8**	**1.5**	**43**	**24**	**67**	**85**	**INDX**	**RAFT**	**1**	**3**	**4**		**20**	**60**		WDFW
16 0251	**10/14/99**	**0.3**	**1.0**	**0.7**	**10**	**13**	**23**	**95**	**INDX**	**FOOT**	**1**	**3**	**4**		**20**	**60**	**61**	WDFW
16 0251	**10/14/99**	**1.0**	**1.8**	**0.8**	**0**	**0**	**0**	**95**	**INDX**	**FOOT**	**1**	**3**	**4**		**20**	**60**	**61**	WDFW
16 0251	**10/22/99**	**1.0**	**1.8**	**0.8**	**11**	**5**	**16**	**95**	**INDX**	**FOOT**	**1**	**3**	**4**	**8**	**20**	**61**		WDFW
16 0251	11/02/99	0.3	1.0	0.7	94	0	94	80	INDX	FOOT	3	4			24	60	61	WDFW
16 0251	11/02/99	1.0	1.8	0.8	80	0	80	80	INDX	FOOT	3	4			24	60	61	WDFW

Notes:
8/19/99 – Water very "green" from snowmelt. Poor visibility, especially in holes.
8/27/99 – Chums mixed with pinks in pools, chum count conservative.
9/10/99 – Chinook and most of chums were mixed together in pools (lots of chinook). Counts conservative.

John Creek (WRIA 16.0253)

Summer 1999

Reach	**River mile 0.0-1.6**
Estimate	0
Method	N/A
Quality rating	Good
Comments	Assumed no spawning due to no fish observed in several spot checks, and low flows all season at mouth prevented access by summer chum.

Duckabush River (WRIA 16.0351)

Summer 1999

Reach	**River mile 0.0-2.3**
Estimate	92
Method	AUC - 10 day stream life
Quality rating	Good

Comments — Starting point of curve required a little subjectivity. Surveyors subjectively felt the stream life was longer-than-average this year, which is possible because flows were rather high and cold for a long period due to the high snow-pack.

One snorkel survey was conducted by Thom Johnson (WDFW, District Fish Biologist). This data was not used in the escapement estimate, since the technique is so different in viewing capabilities compared with "above water" survey methods.

Table 1.6. Duckabush River 1999 chum survey data through Nov. 2.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Type Survey	Method	Other Species				Comments			Agency
16 0351	08/19/99	0.3	2.3	2	0	0	0	70	INDX	RAFT					60	24		WDFW
16 0351	**08/27/99**	**0.1**	**2.3**	**2.2**	**0**	**0**	**0**	**80**	**INDX**	**RAFT**	**3**	**0**	**0**	**0**	**24**			WDFW
16 0351	**09/10/99**	**0.1**	**2.3**	**2.3**	**16**	**0**	**16**	**80**	**INDX**	**RAFT**	**3**	**0**	**0**	**0**	**21**	**60**		WDFW
16 0351	09/17/99	0.1	2.3	2.2	59	0	59	80	SUPP	SNKL	1	3	4	0	23			WDFW
16 0351	09/17/99	2.3	3.7	1.4	0	0	0	80	SUPP	SNKL	1	3	4	0	23			WDFW
16 0351	**09/20/99**	**0.1**	**2.3**	**2.2**	**26**	**0**	**26**	**80**	**INDX**	**RAFT**	**3**	**0**	**0**	**0**	**21**			WDFW
16 0351	**09/29/99**	**0.1**	**2.3**	**2.2**	**33**	**0**	**33**	**80**	**INDX**	**RAFT**	**3**	**0**	**0**	**0**	**20**			WDFW
16 0351	**10/06/99**	**0.1**	**1.1**	**1.0**	**5**	**0**	**5**	**80**	**INDX**	**FOOT**	**1**	**3**	**4**	**0**	**20**	**60**		WDFW
16 0351	**10/06/99**	**1.1**	**2.3**	**1.2**	**8**	**5**	**13**	**80**	**INDX**	**FOOT**	**1**	**3**	**4**	**0**	**20**	**60**		WDFW
16 0351	**10/14/99**	**0.1**	**1.1**	**1.0**	**1**	**1**	**2**	**90**	**INDX**	**FOOT**	**1**	**3**	**4**	**0**	**20**	**60**	**61**	WDFW
16 0351	**10/14/99**	**1.1**	**2.3**	**1.2**	**1**	**20**	**21**	**90**	**INDX**	**FOOT**	**1**	**3**	**4**	**0**	**20**	**60**	**61**	WDFW
16 0351	10/22/99	0.1	1.1	1.0	0	1	1	95	INDX	FOOT	3	4	7	0	20	60	61	WDFW
16 0351	10/22/99	1.1	2.3	1.2	0	7	7	95	INDX	FOOT	3	4	7	0	20	60	61	WDFW
16 0351	10/29/99	2.3			0	0	0		SPOT	FOOT					27	60		WDFW
16 0351	11/02/99	0	2.3	2.3	8	1	9	85	INDX	FOOT	3	0	0	0	24	60	61	WDFW

Notes:
Aug. 29, 27 : Visibility in pools only fair due to glacial melt.
Sept. 10 : No fish observed spawning yet.

Dosewallips River (WRIA 16.0442)

Summer 1999

Reach	**River mile 0.1-2.3**
Estimate	351
Method	AUC - 10 day stream life
Quality rating	Fair / Good
Comments	Most of curve defined OK by survey data, but visibility was poor (70%) on two surveys. Surveyors subjectively felt the stream life was longer-than-average this year, which is possible because flows were rather high and cold for a long period due to the high snow-pack.

Table 1.7. Dosewallips River 1999 chum survey data through Oct. 20.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Type Survey	Method	Other Species				Comments			Agency
16 0442	**08/19/99**	**0.1**	**2.3**	**2.2**	**0**	**0**	**0**	**40**	**INDX**	**RAFT**					**60**	**38**	**24**	WDFW
16 0442	**09/10/99**	**0.1**	**2.3**	**2.2**	**24**	**0**	**24**	**70**	**INDX**	**RAFT**	**3**	**0**	**0**	**0**	**24**	**60**		WDFW
16 0442	**09/20/99**	**0.1**	**2.3**	**2.2**	**92**	**0**	**92**	**70**	**INDX**	**RAFT**	**3**	**0**	**0**	**0**	**24**			WDFW
16 0442	**09/20/99**	**2.3**	**2.6**	**0.3**	**0**	**0**	**0**	**70**	**SUPP**	**RAFT**	**3**	**0**	**0**	**0**	**24**			WDFW
16 0442	**10/01/99**	**0.1**	**2.3**	**2.2**	**132**	**11**	**143**	**80**	**INDX**	**RAFT**	**1**	**3**	**0**	**0**	**21**	**60**		WDFW
16 0442	**10/01/99**	**2.3**	**3.0**	**0.7**	**8**	**0**	**8**	**80**	**SUPP**	**RAFT**	**3**	**0**	**0**	**0**	**21**	**60**		WDFW
16 0442	**10/13/99**	**0.1**	**2.3**	**2.2**	**11**	**5**	**16**	**80**	**INDX**	**RAFT**	**3**	**4**	**0**	**0**	**21**	**60**		WDFW
16 0442	**10/13/99**	**2.3**	**2.8**	**0.5**	**0**	**0**	**0**		**SUPP**	**RAFT**	**1**	**3**	**4**	**0**	**21**			WDFW
16 0442	10/13/99	3.6	6.7	3.1	0	0	0	80	SUPP	RAFT	1	3	4	0	21			WDFW
16 0442	10/20/99	0.0	1.3	1.3	0	6	6	95	INDX	FOOT	1	3	4	7	20	61		WDFW
16 0442	10/20/99	1.3	2.3	1.0	0	0	0		INDX	FOOT	1	3	4	7	20	61		WDFW

Notes:
Aug. 19 : Lots of snowmelt. Poor visibility in holes.
Sept. 10 : Most of fish above power lines (RM 1.3). Most of fish still holed up. 4 ft vis. In pools – water slightly murky.

Big Quilcene River (WRIA 17.0012)

Summer 1999

Reach	**River mile 0.0-2.7**
Estimate	2,981
Method	AUC - 10 day stream life
Quality rating	Very Good
Comments	USFWS took 171 broodstock from bay setnets/seines (of these 3 died during capture), and 1 fish entered the hatchery rack. A total of 172 summer chum were utilized in the 1999 QNFH supplementation program: 81 males and 88 females were spawned, and 3 males were mortalities. It was assumed rack capture fish moved rapidly enough through river to avoid being censused in spawner surveys.

Table 1.8. Big Quilcene River 1999 chum survey data through Nov. 3.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Type Survey	Method	Other Species				Comments			Agency
17 0012	**08/20/99**	**0**	**2.7**	**2.7**	**25**	**0**	**25**	**70**	**INDX**	**SNKL**	**4**	**0**	**0**	**0**	**60**	**23**	**31**	USFWS
17 0012	**08/27/99**	**0**	**1.8**	**1.8**	**3**	**0**	**3**	**60**	**INDX**	**FOOT**	**4**	**0**	**0**	**0**	**24**	**31**	**60**	WDFW
17 0012	**08/27/99**	**1.8**	**2.7**	**0.9**	**4**	**0**	**4**	**60**	**INDX**	**FOOT**	**4**	**0**	**0**	**0**	**24**	**31**	**60**	WDFW
17 0012	**09/03/99**	**0**	**1.8**	**1.8**	**60**	**0**	**60**	**85**	**INDX**	**FOOT**	**3**	**4**	**0**	**0**	**20**			WDFW
17 0012	**09/03/99**	**1.8**	**2.7**	**0.9**	**244**	**1**	**245**	**85**	**INDX**	**FOOT**	**3**	**4**	**0**	**0**	**20**			WDFW
17 0012	**09/10/99**	**0**	**1.8**	**1.8**	**149**	**2**	**151**	**80**	**INDX**	**FOOT**					**23**	**60**		WDFW
17 0012	**09/10/99**	**1.8**	**2.7**	**0.9**	**524**	**1**	**525**	**80**	**INDX**	**FOOT**					**23**	**60**		WDFW
17 0012	**09/16/99**	**0**	**2.7**	**2.7**	**1407**	**18**	**1425**	**90**	**INDX**	**FOOT**	**3**	**0**	**0**	**0**	**20**	**60**		WDFW
17 0012	**09/24/99**	**0**	**1.8**	**1.8**	**788**	**114**	**932**	**90**	**INDX**	**FOOT**	**3**	**0**	**0**	**0**	**20**	**60**		WDFW
17 0012	**09/24/99**	**1.8**	**2.7**	**0.9**	**404**	**261**	**665**	**90**	**INDX**	**FOOT**	**3**	**0**	**0**	**0**	**20**	**60**		WDFW
17 0012	**10/01/99**	**0**	**1.8**	**1.8**	**248**	**374**	**622**	**90**	**INDX**	**FOOT**	**3**				**20**	**60**		WDFW
17 0012	**10/01/99**	**1.8**	**2.7**	**0.9**	**106**	**210**	**316**	**90**	**INDX**	**FOOT**	**3**				**20**	**60**		WDFW
17 0012	**10/06/99**	**0**	**2.7**	**2.7**	**70**	**529**	**599**	**90**	**INDX**	**FOOT**					**20**	**60**		WDFW
17 0012	**10/13/99**	**0**	**1.8**	**1.8**	**6**	**NC**		**90**	**INDX**	**FOOT**					**20**	**60**		WDFW
17 0012	**10/13/99**	**1.8**	**2.7**	**0.9**	**0**	**NC**		**90**	**INDX**	**FOOT**					**20**	**60**		WDFW
17 0012	11/03/99	0	2.8	2.8	9	0	9	90	INDX	FOOT	4	0	0	0	20	60	61	WDFW

Little Quilcene River (WRIA 17.0076)

Summer 1999

Reach	**River mile 0.0-1.8**
Estimate	84
Method	Redd count
Quality rating	Fair
Comments	Redds were expanded to an estimate of total fish that spawned in stream reach by assuming 1 female per redd and using a 1:1 sex ratio A total of 172 summer chum were utilized in the 1999 QNFH supplementation program: 81 males and 88 females were spawned, and 3 males were mortalities. Based on this, sex ratio would be 0.95 males per female. It was decided to use a 1:1 sex ratio for Little Quilcene since all other indicators of sex ratio in 1999 had more males than females (i.e., at Chimacum Creek, Salmon Creek). 42 redds + (42 redds x 1:1 M:F ratio) = 84 fish

Table **1.9.** Little Quilcene River 1999 chum survey data through Nov. 3.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	New redds	Vis	Type Survey	Method	Other Species	Comments	Agency
17 0076	**08/20/99**	**0**	**1.8**	**1.8**	**0**	**0**	**0**	**0**	**90**	**INDX**	**FOOT**		**20**	WDFW
17 0076	**08/27/99**	**0**	**1.8**	**1.8**	**0**	**0**	**0**	**0**	**90**	**INDX**	**FOOT**		**20**	WDFW
17 0076	**09/03/99**	**0**	**1.8**	**1.8**	**0**	**0**	**0**	**0**	**90**	**INDX**	**FOOT**		**20**	WDFW
17 0076	**09/10/99**	**0**	**0.8**	**0.8**	**18**	**0**	**18**	**0**	**85**	**INDX**	**FOOT**		**20 60**	WDFW
17 0076	**09/16/99**	**0**	**0.8**	**0.8**	**12**	**2**	**14**	**12**	**90**	**INDX**	**FOOT**		**20**	WDFW
17 0076	**09/20/99**	**0**	**0.8**	**0.8**	**34**	**2**	**36**	**6**	**90**	**INDX**	**FOOT**		**20 60**	WDFW
17 0076	**09/20/99**	**0.8**	**1.8**	**1.0**	**0**	**0**	**0**	**1**	**90**	**INDX**	**FOOT**		**20 60**	WDFW
17 0076	**09/24/99**	**0**	**0.8**	**0.8**	**18**	**5**	**23**	**1**	**90**	**INDX**	**FOOT**		**20 60**	WDFW
17 0076	**09/24/99**	**0.8**	**1.8**	**1.0**	**1**	**0**	**1**	**12**	**90**	**INDX**	**FOOT**		**20 60**	WDFW
17 0076	**09/27/99**	**0**	**0.8**	**0.8**	**18**	**11**	**29**	**2**	**95**	**INDX**	**FOOT**		**20 60**	WDFW
17 0076	**09/30/99**	**0**	**0.8**	**0.8**	**7**	**11**	**18**	**5**	**95**	**INDX**	**FOOT**		**20 60**	WDFW
17 0076	**09/30/99**	**0.8**	**1.8**	**1.0**	**0**	**6**	**0**	**1**	**95**	**INDX**	**FOOT**		**20 60**	WDFW
17 0076	**10/06/99**	**0**	**0.8**	**0.8**	**1**	**16**	**17**	**2**	**95**	**INDX**	**FOOT**		**20 60**	WDFW
17 0076	**10/06/99**	**0.8**	**1.8**	**1.0**	**0**	**0**	**0**	**0**	**95**	**INDX**	**FOOT**		**20 60**	WDFW
17 0076	11/03/99	0	1.8	1.8	0	0	0	--	95	INDX	FOOT	4 0 0 0	20	WDFW

Notes:
Sept. 10 : Chum only observed up to powerlines (RM 0.4), so TJ doesn't think any fish were missed by not surveying the RM 0.8+ reach.

Chimacum Creek (WRIA 17.0203)

Summer 1999

Reach	**River mile 0.0-1.1**
Estimate	38
Method	Redd counts
Quality rating	Fair
Comments	Spawner surveys done by trained Wild Olympic Salmon (WOS) volunteers under the supervision of WDFW. A total of 17 new redds observed. Redds were expanded to an estimate of total fish that spawned in stream reach by assuming 1 female per redd and using sex ratio observed at Salmon Creek trap in 1999, i.e., (233 males / 190 females). Redd counts were used because comparison of redd counts and live fish counts for Snow Creek indicates a significant portion of the live fish can go unobserved in small runsize years. AUC estimate not possible due to minimal number of fish observed. Beginning with BY 1996, eyed eggs were transferred in from Salmon Creek as part of a reintroduction program. The first natural spawning by summer chum in Chimacum Creek since the mid-1980's occurred during fall, 1999. Escapement = (17 redds) x (1.23 M/F) x (1 F per redd) = 38.

Snow Creek (WRIA 17.0219)

Summer 1999

Reach	River mile 0.0 - 0.8
Estimate	29
Method	(Redd counts downstream of trap) + (trap passage count)
Quality rating	Fair
Comments	Redds were expanded to an estimate of total fish that spawned in stream reach by assuming 1 female per redd and using sex ratio observed at Salmon Creek trap in 1999, i.e., (233 males / 190 females). Redd counts were used because comparison of redd counts and live fish counts for this stream indicates a significant portion of the live fish can go unobserved in small runsize years. AUC estimate not possible due to minimal fish observed. No fish captured in trap in 1999. Data from Thom H. Johnson (WDFW) memo dated December 4, 2000: Escapement = (13 redds) x (1.23 M/F) x (1 F per redd)

Salmon Creek (WRIA 17.0245)

Summer 1999

Reach	**River mile 0.3 upstream**
Estimate	434
Method	(Trap count) -(broodstock take adjustment) + (redd counts downstream of trap)
Quality rating	Very good
Comments	Trap operated continuously at RM 0.3 by WDFW from August 24 through October 18, 1999 as part of a supplementation program initiated with brood year 1992.

Data from Thom H. Johnson (WDFW) memo dated December 4, 2000:

Salmon Creek summer chum, 1999

	Males	Females	Total	
Upstream of trap	199	159	358	natural escapement
Spawned at trap	34	31	65	for supplementation
Total in trap	233	190	423	
Downstream of trap	34 redds @ 1.23 M:F and 1 F per redd = 76 natural escapement			
Natural escapement	434	summer chum		
Total return	499	summer chum		

Jimmycomelately Creek (WRIA 17.0285)

Summer 1999

Reach	**River mile 0.0 upstream**
Estimate	1
Method	(Trap count) – (broodstock take adjustment) + (redd counts downstream of trap)
Quality rating	Very good
Comments	Trap operated continuously by WDFW at RM 0.1 from August 30 through October 15, 1999 as part of a supplementation program initiated with brood year 1999. A total of 6 adults (2 males, 4 females) were captured in trap; in addition, 1 predator-killed female found downstream of trap. Two males and two females spawned for program; one trapped female was partially spawned and one died before spawning due to lack of a male. Total return = 7.

Dungeness River (WRIA 18.0018)

Summer 1999

Reach	**River mile 0.0 upstream**
Estimate	
Method	
Quality rating	
Comments	Eleven surveys were conducted between August 9 and October 28 from RM 0.0 to 3.3; 2 live and 1 dead chum were observed during the October surveys.

Table 1.9. Dungeness River 1999 chum survey data through Oct 28.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Type Survey	Method	Other Species	Comments	Agency
18 0018	8/09/99	9.8	0.0	0.0	0	0	0	20	SPOT	FOOT		20	WDFW
18 0018	8/16/99	7.3	0.0	0.0	0	0	0	50	SPOT	FOOT		20	WDFW
18 0018	8/25/99	3.3	0.0	0.0	0	0	0	35	SPOT	FOOT		20	WDFW
18 0018	9/10/99	0.0	3.3	3.3	0	0	0	60	SUPP	FOOT		20 60	WDFW
18 0018	9/16/99	0.0	3.3	3.3	0	0	0	70	SUPP	FOOT		20	WDFW
18 0018	9/22/99	0.0	3.3	3.3	0	0	0	70	SUPP	FOOT		20 60	WDFW
18 0018	9/27/99	0.0	3.3	3.3	0	0	0	70	SUPP	FOOT		20 60	WDFW
18 0018	10/04/99	0.0	3.3	3.3	0	1	1	70	SUPP	FOOT		20 60	WDFW
18 0018	10/13/99	0.0	3.3	3.3	0	0	0	75	SUPP	FOOT		20 60	WDFW
18 0018	10/20/99	0.0	3.3	3.3	2	0	2	70	SUPP	FOOT		20 60	WDFW
18 0018	10/28/99	3.3	0.0	0.0	0	0	0	10	SPOT	FOOT		20 60	WDFW

2000 Summer Chum Natural Spawning Escapement Summary

Big Beef Creek (WRIA 15.0389)

Summer 2000

Reach	**River mile 0.0 upstream**
Estimate	0
Method	(trap count) - (broodstock take adjustment)
Quality rating	Very good
Comments	Trap operated continuously by UW and WDFW from Sept. 1 through Oct. 2000. All 20 fish (9 males, 11 females) captured in trap were spawned as part of a reintroduction program initiated with brood year 1996.

Anderson Creek (WRIA 15.0412)

Summer 2000

Reach	**River mile 0.0-1.0**
Estimate	0
Method	See comments.
Quality rating	Very good
Comments	Assumed escapement was zero due to apparent extirpation of the population, and no fish observed during 7 surveys Sept. 7 to Oct. 17. Assumed the 3 fish observed on Oct. 26 were early fall chum.

Table 1.10. Anderson Creek 2000 chum survey data through Oct. 26.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Type Survey	Method	Other Species				Comments			Agency
15 0412	09/07/00	0.0	1.0	1.0	0	0	0	95	INDX	FOOT	8	0	0	0	20	48	60	WDFW
15 0412	09/14/00	0.0	1.0	1.0	0	0	0	95	INDX	FOOT	0	0	0	0	20	48	60	WDFW
15 0412	09/22/00	0.0	1.0	1.0	0	0	0	95	INDX	FOOT	0	0	0	0	20	48	60	WDFW
15 0412	10/02/00	0.0	1.0	1.0	0	0	0	95	INDX	FOOT	0	0	0	0	20	47	60	WDFW
15 0412	10/10/00	0.0	1.0	1.0	0	0	0	95	INDX	FOOT	1	4	0	0	20	47	60	WDFW
15 0412	10/17/00	0.0	1.0	1.0	0	0	0	90	INDX	FOOT	4	8	0	0	20	47		WDFW
15 0412	10/26/00	0.0	1.0	1.0	3	0	3	95	INDX	FOOT	0	0	0	0	20	60	61	WDFW

Notes:
Beaver dams blocked fish passage until Oct. 2, dams were notched to allow passage.

Dewatto River (WRIA 15.0420)

Summer 2000

Reach	**River mile 0.3-1.8**
Estimate	10
Method	(Live + dead Oct. 2 survey) + (average live + dead Sept. 7 and Sept. 14 surveys.)
Quality rating	Good
Comments	Assumed the 2 live fish observed on Sept. 7 and Sept. 14 were the same fish. Assumed live fish observed beginning Oct. 10 were fall chum.

Table 1.11. Dewatto River 2000 chum survey through Oct. 26.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Type Survey	Method	Other Species	Comments	Agency
15 0420	**09/07/00**	**0.3**	**1.8**	**1.5**	**2**	**0**	**2**	**95**	**INDX**	**FOOT**	**1 8**	**20 60 61**	WDFW
15 0420	**09/14/00**	**0.3**	**1.8**	**1.5**	**2**	**0**	**2**	**90**	**INDX**	**FOOT**	**1 8**	**20 60**	WDFW
15 0420	**09/22/00**	**0.3**	**1.8**	**1.5**	**0**	**0**	**0**	**95**	**INDX**	**FOOT**	**1 8**	**20**	WDFW
15 0420	**10/02/00**	**0.3**	**1.8**	**1.5**	**7**	**1**	**8**	**95**	**INDX**	**FOOT**	**1 4 8**	**20 60 61**	WDFW
15 0420	10/10/00	0.3	1.8	1.5	5	0	5	95	INDX	FOOT	1 4 8	20 61	WDFW
15 0420	10/17/00	0.3	1.8	1.5	6	1	7	90	INDX	FOOT	1 4 8	20 61	WDFW
15 0420	10/26/00	0.3	1.8	1.5	199	15	214	95	INDX	FOOT	1 4 8	20	WDFW

Notes:
Due to early returns of fall chum, a summer cut off of Oct. 20 was established for estimating escapements for 2000 summer chum.
Oct. 26 - observed chum were assumed to be early fall chum.

Tahuya River (WRIA 15.0446)

Summer 2000

Reach	**River mile 0.0-2.6**
Estimate	2
Method	Live + dead Sept. 22 and Oct. 2 surveys
Quality rating	Good
Comments	Two fish were observed in 5 surveys from Sept. 7 through Oct. 10. Assumed fish observed on Sept. 22 and Oct. 2 were different fish. October 17 observed live were presumed to be the beginning of the fall run.

Table 1.12. Tahuya River 2000 chm survey data through Oct. 17.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Type Survey	Method	Other Species	Comments	Agency
15 0446	**09/07/00**	**0.0**	**2.6**	**2.6**	**0**	**0**	**0**	**95**	**INDX**	**FOOT**	**8**	**20 60**	WDFW
15 0446	**09/14/00**	**0.0**	**2.6**	**2.6**	**0**	**0**	**0**	**90**	**INDX**	**FOOT**		**20 60**	WDFW
15 0446	**09/22/00**	**0.0**	**2.6**	**2.6**	**1**	**0**	**1**	**95**	**INDX**	**FOOT**	**1 4 8**	**20 60**	WDFW
15 0446	**10/02/00**	**0.0**	**2.6**	**2.6**	**1**	**0**	**1**	**95**	**INDX**	**FOOT**	**1 4 8**	**20 60 61**	WDFW
15 0446	**10/10/00**	**0.0**	**2.6**	**2.6**	**0**	**0**	**0**	**95**	**INDX**	**FOOT**	**1 4 8**	**20 61**	WDFW
15 0446	10/17/00	0.0	2.6	2.6	17	0	17	90	INDX	FOOT	1 4 8	20	WDFW

Union River (WRIA 15.0503)

Summer 2000

Reach	**River mile 0.3 upstream**
Estimate	682
Method	(Trap count) - (broodstock take adjustment)
Quality rating	Very good
Comments	Trap operated continuously by HCSEG and WDFW from Aug. 18 through Oct. 2, 2000 as part of a supplementation program initiated with brood year 2000. Total return = 744 adults. A total of 62 adults (30 males, 32 females) removed for broodstock. Natural escapement = (744 adults trapped) - (62 broodstock removed) = 682

Lilliwaup Creek (WRIA 16.0230)

Summer 2000

Reach	**River mile 0.0-0.7**
Estimate	2
Method	(Trap count) - (broodstock take adjustment) + (redd count downstream of trap)
Quality rating	Very good
Comments	Trap operated continuously by LLTK and WDFW from Sept. 1 through Oct. 12, 2000. All 21 fish (14 males, 7 females) captured in trap were collected for broodstock as part of a supplementation program initiated with brood year 1992. Of 21 adults trapped, 7 males and 7 females were spawned; the other 7 males entered the trap after the last female and died without spawning. One redd was observed downstream of the trap and a spawned-out female was collected. The male that spawned with the female downstream of the trap was captured and included in the trap count. Total return = (1 F downstream of trap) + (21 adults trapped) = 22. Natural escapement = (1 redd) x (1M:F) x (1 F per redd) = 2

Hamma Hamma River (WRIA 16.0251)

Summer 2000

Reach	**River mile 0.3-1.8**
Estimate	173
Method	(AUC 10 day stream life) - (broodstock take adjustments)
Quality rating	Good
Comments	As part of a supplementation program initiated with brood year 1997, 56 fish (30 males, 26 females) were collected by beach seine for use as broodstock from Sept. 7 through Oct. 19. Adjusted escapement = [(2007 FD) - (56 broodstock x 5 days assumed average residence before removal)]/(10 day stream life) = 173 Total return = (173 natural esc.) + (56 broodstock) = 229

Table 1.13. Hamma Hamma River 2000 chum survey data through Oct. 13.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Type Survey	Method	Other Species	Comments	Agency
06 0251	**08/30/00**	**0.3**	**1.8**	**1.5**	**13**	**0**	**13**	**90**	**INDX**	**FOOT**	**1 4**	**20 60 61**	WDFW
06 0251	**09/06/00**	**0.3**	**1.8**	**1.5**	**30**	**0**	**30**	**90**	**INDX**	**FOOT**	**1 4 5**	**20 60 61**	WDFW
06 0251	**09/20/00**	**0.3**	**1.8**	**1.5**	**75**	**12**	**87**	**90**	**INDX**	**FOOT**	**1 4**	**20 60 61**	WDFW
06 0251	**09/27/00**	**0.3**	**1.8**	**1.5**	**61**	**34**	**95**	**90**	**INDX**	**FOOT**	**1 4 5**	**20 60 61**	WDFW
06 0251	**10/04/00**	**0.3**	**1.8**	**1.5**	**31**	**45**	**76**	**90**	**INDX**	**FOOT**	**1 4**	**20 60 61**	WDFW
06 0251	10/13/00	0.3	1.8	1.5	158 [1]	27 [1]	185 [1]	90	INDX	FOOT	1 4	20 60	WDFW

[1] Fish observed on 10/13 were assumed to be early fall fish and are not included in the summer chum escapement estimate.

John Creek (WRIA 16.0253)

Summer 2000

Reach	**River mile 0.0-1.6**
Estimate	0
Method	See comments.
Quality rating	Fair
Comments	No formal surveys conducted. Spot observations by LLTK, HCSEG and WDFW indicated that flows at mouth of stream prevented access by summer chum.

Duckabush River (WRIA 16.0351)

Summer 2000

Reach	**River mile 0.0-2.3**
Estimate	464
Method	AUC 10 day stream life
Quality rating	Good
Comments	Last survey was a spot survey in high, muddy conditions, therefore a rating of Good is appropriate.

Table 1.14. Duckabush River 2000 chum survey data through Oct. 20.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Type Survey	Method	Other Species	Comments	Agency
16 0351	09/08/00	0.0	2.3	2.3	18	0	18	90	INDX	FOOT	1	20 60 61	WDFW
16 0351	09/15/00	0.0	2.3	2.3	153	0	153	90	INDX	FOOT	1	21 60	WDFW
16 0351	09/25/00	0.1	2.3	2.2	170	16	186	90	INDX	FOOT		20 60	WDFW
16 0351	10/04/00	0.0	2.3	2.3	120	62	182	90	INDX	FOOT	4	20 60 61	WDFW
16 0351	10/13/00	0.0	2.3	2.3	55	79	182	90	INDX	FOOT	1 4	20 60 61	WDFW
16 0351	10/20/00	0.0	0.0	0.0	0	0	0	0	INDX	FOOT		28	WDFW

Dosewallips River (WRIA 16.0442)

Summer 2000

Reach	**River mile 0.0-2.3**
Estimate	1260
Method	AUC 10 day stream life
Quality rating	Good
Comments	Last survey was a spot survey in high, muddy conditions, therefore a rating of Good is appropriate.

Table 1.15. Dosewallips River 2000 chum survey data through Oct. 20.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Type Survey	Method	Other Species	Comments	Agency
16 0442	09/08/00	0.0	2.3	2.3	104	0	104	90	INDX	FOOT	1	20 60 61	WDFW
16 0442	09/15/00	0.0	2.3	2.3	351	0	351	90	INDX	FOOT	1	21 60	WDFW
16 0442	09/25/00	0.0	2.3	2.3	572	16	588	90	INDX	FOOT		20 60	WDFW
16 0442	10/04/00	0.0	2.3	2.3	248	165	413	90	INDX	FOOT	1 4	20 60 61	WDFW
16 0442	10/13/00	0.0	2.3	2.3	27	85	112	85	INDX	FOOT	4	20 60	WDFW
16 0442	10/20/00	0.0	0.0	0.0	0	0	0	0	INDX	FOOT		28 60	WDFW

Big Quilcene River (WRIA 17.0012)

Summer 2000

Reach	**River mile 0.0-2.7**
Estimate	5126
Method	(AUC - 10 day stream life) - (recycled fish adjustment)
Quality rating	Good
Comments	As part of a supplementation program initiated with brood year 1992, USFWS caught 252 broodstock from Quilcene Bay in beach seines (of these 35 died during capture), and 483 fish entered the hatchery rack (of these 196 were returned live, i.e., recycled to the lower river). It was assumed fish that entered the hatchery rack moved rapidly enough through the river to avoid being counted in spawner surveys. Adjusted escapement = [(52245 fish-days) - (196 recycled fish x 5 days assumed average residence after recycling)]/(10 day stream life).

Table 1.16. Big Quilcene River 2000 chum survey data through Oct. 11.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Type Survey	Method	Other Species	Comments	Agency
17 0012	08/17/00	0.0	2.7	2.7	1	0	1	90	INDX	SNKL		20	USFWS
17 0012	08/24/00	0.0	0.7	0.7	0	0	0	90	INDX	FOOT	4	20	WDFW
17 0012	09/01/00	0.0	2.7	2.7	95	2	97	90	INDX	FOOT		20 60	WDFW
17 0012	09/08/00	0.0	2.7	2.7	1662	10	1672	90	INDX	FOOT		20 60	WDFW
17 0012	09/15/00	0.0	2.7	2.7	3217	66	3283	90	INDX	FOOT		20 60	WDFW
17 0012	09/25/00	0.0	2.7	2.7	678	0	678	90	INDX	FOOT		20 60	WDFW
17 0012	10/03/00	0.0	2.7	2.7	192	0	192	95	INDX	FOOT		20 60	WDFW
17 0012	10/11/00	0.0	0.7	0.7	32	0	32	95	INDX	FOOT		20 61	WDFW

Little Quilcene River (WRIA 17.0076)

Summer 2000

Reach	**River mile 0.0-1.8**
Estimate	268
Method	AUC -10 day stream life
Quality rating	Good
Comments	

Table 1.17. Little Quilcene river 2000 chum survey data through Oct. 11.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Type Survey	Method	Other Species	Comments	Agency
17 0076	09/02/00	0.0	0.8	0.8	4	0	4	95	INDX	FOOT		20 60	WDFW
17 0076	09/11/00	0.0	1.2	1.2	80	1	81	90	INDX	FOOT		20 60	WDFW
17 0076	09/18/00	0.0	1.8	1.8	115	16	131	90	INDX	FOOT		20 60	WDFW
17 0076	09/25/00	0.0	1.8	1.8	113	43	156	90	INDX	FOOT		20 60	WDFW
17 0076	10/03/00	0.0	1.8	1.8	28	0	28	90	INDX	FOOT		20 60	WDFW
17 0076	10/11/00	0.0	0.8	0.8	2	0	2	90	INDX	FOOT		20 60	WDFW

Chimacum Creek (WRIA 17.0203)

Summer 2000

Reach	**River mile 0.0 -1.1**
Estimate	52
Method	AUC - 10 day stream life
Quality rating	Good
Comments	Spawner surveys done by trained Wild Olympic Salmon (WOS) volunteers under the supervision of WDFW. AUC done for 0.0-0.3 and 0.3-1.1 combined.

Table 1.18. Chimacum Creek 2000 chum survey data through Oct. 11.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Type Survey	Method	Other Species	Comments	Agency
17 0203	09/05/00	0.0	0.3	0.3	1	0	1	80	INDX	FOOT			WOS
17 0203	09/05/00	0.3	1.1	0.8	5	0	5	80	INDX	FOOT			WOS
17 0203	09/12/00	0.0	0.3	0.3	25	4	29	90	INDX	FOOT			WOS
17 0203	09/12/00	0.3	1.1	0.8	11	0	11	90	INDX	FOOT			WOS
17 0203	09/19/00	0.0	0.3	0.3	4	10	14	95	INDX	FOOT			WOS
17 0203	09/19/00	0.3	1.1	0.8	8	8	16	90	INDX	FOOT			WOS
17 0203	09/26/00	0.0	0.3	0.3	2	17	19	85	INDX	FOOT			WOS
17 0203	09/26/00	0.3	1.1	0.8	3	6	9	90	INDX	FOOT			WOS
17 0203	10/04/00	0.0	0.3	0.3	1	10	11	85	INDX	FOOT			WOS
17 0203	10/04/00	0.3	1.1	0.8	1	3	4	85	INDX	FOOT			WOS
17 0203	10/11/00	0.0	0.3	0.3	0	4	4	75	INDX	FOOT			WOS
17 0203	10/11/00	0.3	1.1	0.8	0	4	4	75	INDX	FOOT			WOS

Snow Creek (WRIA 17.0219)

Summer 2000

Reach	**River mile 0.0-0.8**
Estimate	30
Method	(Redd counts downstream of trap) + (trap passage count)

Quality rating	Fair
Comments	Redds were expanded to an estimate of total fish that spawned in stream reach by assuming 1 female per redd and using sex ratio observed at Salmon Creek trap in 2000, i.e., (459 males/342 females). Redd counts were used because comparison of redd counts and live fish counts for this stream indicates a significant portion of the live fish can go unobserved in small runsize years. AUC estimate not possible due to minimal fish observed: 5 dead in 5 surveys from Sept. 9 through Oct. 19. No fish captured in trap in 2000. Data from Thom H. Johnson (WDFW) memo dated December 4, 2000: Escapement = (13 redds) x (1.34 M/F) x (1 F per redd) = 30

Salmon Creek (WRIA 17.0245)

Summer 2000

Reach	**River mile 0.0 upstream**
Estimate	710
Method	(trap count) - (broodstock take adjustment) + (redd counts downstream of trap)
Quality rating	Very good
Comments	Trap operated continuously at RM 0.3 by WDFW from Aug. 21 through Oct. 26, 2000 as part of a supplementation program initiated with brood year 1992.

Data from Thom H. Johnson (WDFW) memo dated December 4, 2000.

Salmon Creek summer chum, 2000

	Males	Females	Total	
Upstream of trap	388	277	665	natural escapement
Spawned at trap	71	65	136	for supplementation
Total in trap	459	342	801	1.34 M:F
Downstream of trap	19 redds @ 1.34 M:F and 1 F per redd = 45 natural escapement			
Natural escapement	710	summer chum		
Total return	846	summer chum		

Jimmycomelately Creek (WRIA 17.0285)

Summer 2000

Reach	**River mile 0.0 upstream**
Estimate	9
Method	(trap count) - (broodstock take adjustment) + (redd counts downstream of trap)
Quality rating	Very good
Comments	Trap operated continuously by WDFW from Aug. 29 through Oct. 15, 2000 as part of a supplementation program initiated with brood year 1999.

Data from Thom H. Johnson (WDFW) memo dated December 4, 2000:

Jimmycomelately Creek summer chum, 2000

	Males	Females	Total	
Upstream of trap	0	0	0	natural escapement
Spawned at trap	24	13 [1]	37	for supplementation
Died unspawned at trap	9	0	9	no females available
Total in trap	33	13	46	
Downstream of trap	2	5	7	carcasses found and 3 redds @ 1.75 M:F and 1 F per redd = 9 natural escapement
Natural escapement	9 [2]	summer chum		
Total return	55	summer chum		

[1] One female was partially spawned out.

[2] All naturally spawning fish were either captured in trap or collected as carcasses.

Dungeness River (WRIA 18.0018)

Summer 2000

Reach	**River mile 0.0 upstream**
Estimate	
Method	
Quality rating	
Comments	Ten surveys were conducted between August 4 and October 18 from RM 0.0 to 3.3; 1 live chum was observed during the October surveys.

Table 1.19. Dungeness River 1999 chum survey data through Oct 18.

WRIA	Date	Lower RM	Upper RM	Length	Live	Dead	Live + Dead	Vis	Type Survey	Method	Other Species	Comments	Agency
18 0018	8/04/00	0.0	3.3	3.3	0	0	0	75	SUPP	FOOT			WDFW
18 0018	8/14/00	0.0	3.3	3.3	0	0	0	80	SUPP	FOOT			WDFW
18 0018	8/24/00	0.9	3.3	2.4	0	0	0	75	SUPP	FOOT			WDFW
18 0018	8/30/00	0.9	3.3	2.4	0	0	0	75	SUPP	FOOT			WDFW
18 0018	9/08/00	0.5	3.3	2.8	0	0	0	80	SUPP	FOOT			WDFW
18 0018	9/14/00	0.0	3.3	3.3	0	0	0	80	SUPP	FOOT			WDFW
18 0018	9/22/00	0.5	3.3	2.8	0	0	0	70	SUPP	FOOT			WDFW
18 0018	10/02/00	0.5	3.3	2.8	0	0	0	80	SUPP	FOOT			WDFW
18 0018	10/09/00	0.0	3.3	3.3	1	0	1	60	SUPP	FOOT			WDFW
18 0018	10/18/00	3.3	0.0	0.0	0	0	0	10	SPOT	FOOT			WDFW

APPENDIX REPORT 2
RUN RECONSTRUCTION

The following tables present the run reconstruction for the return years 1991 through 2000. The estimates for the 1991-1998 returns are included here, because some of the values have been updated from those originally presented in the SCSCI.

Reconstruction of the HC-SJF Summer Chum Salmon ESU Runs

Year															*Management Unit & Total Run Summaries*				
															Terminal	**Seattle (Area 10)** (HC-SJF)	**Admiralty (Area 9)** (HC-SJF)	**U.S. Conv. Areas** (HC-SJF)	**CDN Area 20** (HC-SJF)
1991		**Harvest**		3	0	13	15	751	0	6	66	0	0		0	59	171	483
				**********			**Run Abundance by Location**					**********							
Mgmt Unit	**Prod. Unit**	Escapement	Broodstock	82G/J	12D	12C	82F	12A	12B	12	9A	Discov.	Sequim						
Skokomish	Skokomish	N/A		3		3			3	3	3			*	3	3	3	4	5
12D	Tahuya	5			5	5			5	5	5				233	233	241	262	321
	Union	208			208	218			218	219	228								
12A	L. Quilcene	1						13	13	13	13				837	837	863	939	1,153
	B. Quilcene	49					64	804	804	807	824								
12-12B-12C	Big Beef	0							0	0	0				510	510	526	572	702
	Anderson	0							0	0	0								
	Dosewallips	250							250	251	262								
	Duckabush	102							102	102	107								
	HammaHamma	71							71	71	74								
	Lilliwaup	30				31			31	32	33								
	Dewatto	31				32			32	33	34								
Discovery	Snow	12										12			184		190	206	253
	Salmon	172										172							
Sequim	Jimmycomelate	125											125		125		129	140	172
Totals		1,056	0	3	213	290	64	816	1,529	1,535	1,584	184	125		1,893	1,584	1,952	2,123	2,606
	Hood Canal Portion	747	0												1,584	1,584	1,633	1,776	2,181
	E. Strait Portion	309	0												309		319	347	425

Reconstruction of the HC-SJF Summer Chum Salmon ESU Runs

Year														*Management Unit & Total Run Summaries*				
														Terminal	**Seattle (Area 10)** (HC-SJF)	**Admiralty (Area 9)** (HC-SJF)	**U.S. Conv. Areas** (HC-SJF)	**CDN Area 20** (HC-SJF)
1992		**Harvest**		3	0	0	5	199	0	0	8	0	0		1	44	84	980
				**********	**Run Abundance by Location**	**********												
Mgmt Unit	**Prod. Unit**	Escapement	Broodstock	82G/J	12D	12C	82F	12A	12B	12	9A	Discov.	Sequim					
Skokomish	Skokomish	N/A		3		3			3	3	3			* 3	3	3	3	3
12D	Tahuya	0			0	0			0	0	0			140	140	142	145	183
	Union	140			140	140			140	140	140							
12A	L. Quilcene	9						11	11	11	11			948	948	960	981	1,235
	B. Quilcene	320	414				739	935	935	935	937							
12-12B-12C	Big Beef	0							0	0	0			1,499	1,499	1,517	1,552	1,953
	Anderson	0							0	0	0							
	Dosewallips	655							655	655	657							
	Duckabush	617							617	617	619							
	HammaHamma	123							123	123	123							
	Lilliwaup	81	18			99			99	99	99							
	Dewatto	0				0			0	0	0							
Discovery	Snow	21										21		454		459	470	591
	Salmon	371	62									433						
Sequim	Jimmycomelate	616											616	616		623	637	802
Totals		2,953	494	3	140	242	739	947	2,583	2,583	2,590	454	616	3,660	2,591	3,705	3,788	4,769
	Hood Canal Portion	1,945	432											2,590	2,591	2,622	2,681	3,375
	E. Strait Portion	1,008	62											1,070		1,083	1,107	1,394

Reconstruction of the HC-SJF Summer Chum Salmon ESU Runs

Year														*Management Unit & Total Run Summaries*				
														Terminal	**Seattle (Area 10)** (HC-SJF)	**Admiralty (Area 9)** (HC-SJF)	**U.S. Conv. Areas** (HC-SJF)	**CDN Area 20** (HC-SJF)
1993		**Harvest**		2	0	1	0	15	0	0	2	0	0		0	46	53	67
				**********	**Run Abundance by Location**	**********												
Mgmt Unit	**Prod. Unit**	Escapement	Broodstock	82G/J	12D	12C	82F	12A	12B	12	9A	Discov.	Sequim					
Skokomish	Skokomish	N/A		2		2			2	2	2			* 2	2	2	2	2
12D	Tahuya	0			0	0			0	0	0			252	252	261	271	283
	Union	251			251	252			252	252	252							
12A	L. Quilcene	12						13	13	13	13			163	163	169	175	183
	B. Quilcene	97	39				136	150	150	150	150							
12-12B-12C	Big Beef	0							0	0	0			358	358	370	384	402
	Anderson	0							0	0	0							
	Dosewallips	105							105	105	105							
	Duckabush	105							105	105	105							
	HammaHamma	69							69	69	69							
	Lilliwaup	67	10			77			77	77	77							
	Dewatto	1				1			1	1	1							
Discovery	Snow	11										11		463		479	497	520
	Salmon	400	52									452						
Sequim	Jimmycomelate	110											110	110		114	118	123
Totals		1,228	101	2	251	332	136	163	774	774	776	463	110	1,349	776	1,394	1,447	1,514
	Hood Canal Portion	707	49											776	776	802	833	871
	E. Strait Portion	521	52											573		592	615	643

Reconstruction of the HC-SJF Summer Chum Salmon ESU Runs

Year															*Management Unit & Total Run Summaries*				
															Terminal	**Seattle (Area 10)** (HC-SJF)	**Admiralty (Area 9)** (HC-SJF)	**U.S. Conv. Areas** (HC-SJF)	**CDN Area 20** (HC-SJF)
1994		**Harvest**		1	0	0	0	20	0	0	13	0	0		0	27	54	451
				**********	**Run Abundance by Location**	**********													
Mgmt Unit	**Prod. Unit**	Escapement	Broodstock	82G/J	12D	12C	82F	12A	12B	12	9A	Discov.	Sequim						
Skokomish	Skokomish	N/A		1		1			1	1	1			*	1	1	1	1	1
12D	Tahuya	0			0	0			0	0	0				742	742	749	765	891
	Union	738			738	738			738	738	742								
12A	L. Quilcene	0						0	0	0	0				744	744	751	767	894
	B. Quilcene	349	373				722	742	742	742	744								
12-12B-12C	Big Beef	0							0	0	0				974	974	984	1,004	1,170
	Anderson	0							0	0	0								
	Dosewallips	225							225	225	226								
	Duckabush	263							263	263	264								
	HammaHamma	370							370	370	372								
	Lilliwaup	99	12			111			111	111	112								
	Dewatto	0				0			0	0	0								
Discovery	Snow	2										2			163		165	168	196
	Salmon	137	24									161							
Sequim	Jimmycomelate	15											15		15		15	15	18
Totals		2,198	409	1	738	850	722	742	2,450	2,450	2,461	163	15		2,639	2,461	2,666	2,720	3,171
	Hood Canal Portion	2,044	385												2,461	2,461	2,486	2,536	2,957
	E. Strait Portion	154	24												178		180	183	214

Reconstruction of the HC-SJF Summer Chum Salmon ESU Runs

Year **1995**

Management Unit & Total Run Summaries

	Terminal	Seattle (Area 10) (HC-SJF)	Admiralty (Area 9) (HC-SJF)	U.S. Conv. Areas (HC-SJF)	CDN Area 20 (HC-SJF)
Harvest	0	0	0	68	458

************ Run Abundance by Location ************

Mgmt Unit	Prod. Unit	Escapement	Broodstock	82G/J	12D	12C	82F	12A	12B	12	9A	Discov.	Sequim		Terminal	Seattle (Area 10) (HC-SJF)	Admiralty (Area 9) (HC-SJF)	U.S. Conv. Areas (HC-SJF)	CDN Area 20 (HC-SJF)
Skokomish	Skokomish	N/A		0		0			0	0	0			*	0	0	0	0	0
12D	Tahuya	0			0	0			0	0	0				723	723	723	728	760
	Union	721			721	721			721	721	723								
12A	L. Quilcene	54						54	54	54	54				4,589	4,589	4,589	4,619	4,822
	B. Quilcene	4,029	491				4,520	4,527	4,527	4,527	4,535								
12-12B-12C	Big Beef	0							0	0	0				4,181	4,181	4,181	4,209	4,394
	Anderson	0							0	0	0								
	Dosewallips	2,787							2,787	2,787	2,796								
	Duckabush	825							825	825	828								
	HammaHamma	476							476	476	478								
	Lilliwaup	79	0			79			79	79	79								
	Dewatto	0				0			0	0	0								
Discovery	Snow	25										25			616		616	620	647
	Salmon	538	53									591							
Sequim	Jimmycomelate	223											223		223		223	224	234
Totals		9,757	544	0	721	800	4,520	4,581	9,469	9,469	9,493	616	223		10,332	9,493	10,332	10,400	10,858
	Hood Canal Portion	8,971	491												9,493	9,493	9,493	9,556	9,977
	E. Strait Portion	786	53												839		839	845	882

Reconstruction of the HC-SJF Summer Chum Salmon ESU Runs

Year														*Management Unit & Total Run Summaries*				
														Terminal	**Seattle (Area 10)** (HC-SJF)	**Admiralty (Area 9)** (HC-SJF)	**U.S. Conv. Areas** (HC-SJF)	**CDN Area 20** (HC-SJF)
1996		**Harvest**		9	0	0	0	51	24	24	40	0	0		0	23	80	338
				**********	**Run Abundance by Location**	**********												
Mgmt Unit	**Prod. Unit**	Escapement	Broodstock	82G/J	12D	12C	82F	12A	12B	12	9A	Discov.	Sequim					
Skokomish	Skokomish	N/A		9		9			9	9	9			* 9	9	9	9	9
12D	Tahuya	5			5	5			5	5	5			501	501	502	503	511
	Union	494			494	494			495	495	496							
12A	L. Quilcene	265						266	267	267	267			9,597	9,597	9,607	9,643	9,792
	B. Quilcene	8,479	771				9,250	9,300	9,310	9,321	9,330							
12-12B-12C	Big Beef	0							0	0	0			10,520	10,520	10,531	10,570	10,734
	Anderson	0							0	0	0							
	Dosewallips	6,976							6,984	6,992	7,006							
	Duckabush	2,650							2,653	2,656	2,661							
	HammaHamma	774							775	776	777							
	Lilliwaup	64	12			76			76	76	76							
	Dewatto	0				0			0	0	0							
Discovery	Snow	160										160		1,054		1,055	1,059	1,075
	Salmon	785	109									894						
Sequim	Jimmycomelate	30											30	30		30	30	31
Totals		20,682	892	9	499	584	9,250	9,566	20,573	20,597	20,627	1,054	30	21,711	20,627	21,734	21,814	22,152
	Hood Canal Portion	19,707	783											20,627	20,627	20,649	20,725	21,046
	E. Strait Portion	975	109											1,084		1,085	1,089	1,106

Reconstruction of the HC-SJF Summer Chum Salmon ESU Runs

Year														*Management Unit & Total Run Summaries*				
														Terminal	**Seattle (Area 10)** (HC-SJF)	**Admiralty (Area 9)** (HC-SJF)	**U.S. Conv. Areas** (HC-SJF)	**CDN Area 20** (HC-SJF)
1997		**Harvest**		0	0	77	0	100	3	0	0	0	0		0	0	46	198
				**********		**Run Abundance by Location**				**********								
Mgmt Unit	**Prod. Unit**	Escapement	Broodstock	82G/J	12D	12C	82F	12A	12B	12	9A	Discov.	Sequim					
Skokomish	Skokomish	N/A		0		0			0	0	0			* 0	0	0	0	0
12D	Tahuya	0			0	0			0	0	0			481	481	481	484	493
	Union	410			410	481			481	481	481							
12A	L. Quilcene	29						29	29	29	29			8,006	8,006	8,006	8,042	8,199
	B. Quilcene	7,339	535				7,874	7,974	7,976	7,976	7,976							
12-12B-12C	Big Beef	0							0	0	0			665	665	665	668	681
	Anderson	0							0	0	0							
	Dosewallips	47							47	47	47							
	Duckabush	475							475	475	475							
	HammaHamma	104							104	104	104							
	Lilliwaup	9	18			32			32	32	32							
	Dewatto	6				7			7	7	7							
Discovery	Snow	67										67		901		901	905	923
	Salmon	724	110									834						
Sequim	Jimmycomelate	61											61	61		61	61	62
Totals		9,271	663	0	410	520	7,874	8,003	9,152	9,152	9,152	901	61	10,114	9,152	10,114	10,160	10,358
	Hood Canal Portion	8,419	553											9,152	9,152	9,152	9,194	9,373
	E. Strait Portion	852	110											962		962	966	985

Reconstruction of the HC-SJF Summer Chum Salmon ESU Runs

Year														*Management Unit & Total Run Summaries*				
														Terminal	**Seattle (Area 10)** (HC-SJF)	**Admiralty (Area 9)** (HC-SJF)	**U.S. Conv. Areas** (HC-SJF)	**CDN Area 20** (HC-SJF)
1998		**Harvest**		57	21	0	0	10	16	16	0	0	0		0	53	50	98
				**********	**Run Abundance by Location**	**********												
Mgmt Unit	**Prod. Unit**	Escapement	Broodstock	82G/J	12D	12C	82F	12A	12B	12	9A	Discov.	Sequim					
Skokomish	Skokomish	N/A		57		57			57	57	57			* 57	57	58	58	59
12D	Tahuya	0			0	0			0	0	0			246	246	248	251	255
	Union	223			244	244			245	246	246							
12A	L. Quilcene	265						266	267	268	268			3,086	3,086	3,117	3,145	3,202
	B. Quilcene	2,244	544				2,788	2,797	2,808	2,818	2,818							
12-12B-12C	Big Beef	0							0	0	0			730	730	738	744	758
	Anderson	0							0	0	0							
	Dosewallips	336							337	339	339							
	Duckabush	226							227	228	228							
	HammaHamma	95	32						127	128	128							
	Lilliwaup	3	21			24			24	24	24							
	Dewatto	12				12			12	12	12							
Discovery	Snow	27										27		1,171		1,183	1,193	1,215
	Salmon	1,023	121									1,144						
Sequim	Jimmycomelate	98											98	98		99	100	102
Totals		4,552	718	57	244	337	2,788	3,063	4,105	4,120	4,120	1,171	98	5,389	4,120	5,442	5,492	5,590
	Hood Canal Portion	3,404	597											4,120	4,120	4,161	4,199	4,274
	E. Strait Portion	1,148	121											1,269		1,282	1,293	1,316

Reconstruction of the HC-SJF Summer Chum Salmon ESU Runs

Year														*Management Unit & Total Run Summaries*				
														Terminal	**Seattle (Area 10)** (HC-SJF)	**Admiralty (Area 9)** (HC-SJF)	**U.S. Conv. Areas** (HC-SJF)	**CDN Area 20** (HC-SJF)
1999		**Harvest**		20	0	0	28	10	161	161	0	0	0		0	8	5	24
								********** **Run Abundance by Location** **********										
Mgmt Unit	**Prod. Unit**	Escapement	Broodstock	82G/J	12D	12C	82F	12A	12B	12	9A	Discov.	Sequim					
Skokomish	Skokomish	N/A		20		20			20	21	21			* 21	21	21	21	21
12D	Tahuya	1			1	1			1	1	1			172	172	173	173	174
	Union	159			159	159			165	171	171							
12A	L. Quilcene	84						84	88	91	91			3,528	3,528	3,533	3,537	3,554
	B. Quilcene	2,981	172				3,181	3,191	3,314	3,437	3,437							
12-12B-12C	Big Beef	0	4						4	4	4			772	772	774	774	778
	Anderson	0							0	0	0							
	Dosewallips	351							365	378	378							
	Duckabush	92							96	99	99							
	HammaHamma	212	43						265	275	275							
	Lilliwaup	0	13			13			14	14	14							
	Dewatto	2				2			2	2	2							
Chimacum	Chimacum	38												38		38	38	38
Discovery	Snow	29										29		528		529	529	532
	Salmon	434	65									499						
Sequim	Jimmycomelate	1	6										7	7		7	7	7
Totals		4,384	303	20	160	195	3,181	3,275	4,333	4,493	4,493	528	7	5,066	4,493	5,074	5,079	5,103
	Hood Canal Portion	3,882	232											4,493	4,493	4,500	4,504	4,526
	E. Strait Portion	502	71											573		574	574	577

Reconstruction of the HC-SJF Summer Chum Salmon ESU Runs

Year														*Management Unit & Total Run Summaries*				
														Terminal	**Seattle (Area 10)** (HC-SJF)	**Admiralty (Area 9)** (HC-SJF)	**U.S. Conv. Areas** (HC-SJF)	**CDN Area 20** (HC-SJF)
2000		**Harvest**		0	0	0	0	707	0	0	0	0	0		1	0	9	27

				********** Run Abundance by Location **********														
Mgmt Unit	**Prod. Unit**	Escapement	Broodstock	82G/J	12D	12C	82F	12A	12B	12	9A	Discov.	Sequim					
Skokomish	Skokomish	N/A		0		0			0	0	0			* 0	0	0	0	0
12D	Tahuya	2			2	2			2	2	2			746	746	746	747	749
	Union	682	62		744	744			744	744	744							
12A	L. Quilcene	268						300	300	300	300			6,605	6,606	6,606	6,611	6,628
	B. Quilcene	5,126	504				5,630	6,305	6,305	6,305	6,305							
12-12B-12C	Big Beef	0	20						20	20	20			2,005	2,005	2,005	2,007	2,012
	Anderson	0							0	0	0							
	Dosewallips	1,260							1,260	1,260	1,260							
	Duckabush	464							464	464	464							
	HammaHamma	173	56						229	229	229							
	Lilliwaup	2	20			22			22	22	22							
	Dewatto	10				10			10	10	10							
Chimacum	Chimacum	52												52		52	52	52
Discovery	Snow	30										30		876		876	877	879
	Salmon	710	136									846						
Sequim	Jimmycomelate	9	46										55	55		55	55	55
Totals		8,788	844	0	746	778	5,630	6,605	9,356	9,356	9,356	876	55	10,339	9,357	10,340	10,349	10,375
	Hood Canal Portion	7,987	662											9,356	9,357	9,357	9,365	9,389
	E. Strait Portion	801	182											983		983	984	986

APPENDIX REPORT 3

STATUS OF ARTIFICIAL PRODUCTION PROGRAMS IN MEETING SPECIFIED MITIGATION MEASURES TO REDUCE RISK OF NEGATIVE INTERACTIONS WITH SUMMER CHUM SALMON

The Summer Chum Salmon Conservation Initiative (section 3.3.2.1) specifies risk aversion and monitoring/evaluation measures to be met by artificial production programs that have medium to high risk of hazards affecting summer chum. These mitigation measures have been specified in four categories: hatchery operations, predation, competition and behavior modification, and fish disease transfer. Following is a progress report on the status of the artificial production programs in meeting the mitigation measures in 1999 and 2000. Unless otherwise specified, comments on status apply to both years. The artificial production programs and mitigation measures are presented in the following format.

Species

Program/Sponsor/Release Class

Hazard

Mitigation Measures

Status

The order of artificial production programs (projects) and the specified mitigation measures follow the order of information shown in Table 3.1 that summarizes the status of mitigation measures in the main body of the present report. The risk aversion and monitoring/evaluation measures are represented by the abbreviations "r.a." and "m&e", respectively. The symbols "(**Y**)", "(**N**)", "(**Y/N**)" and "(**NA**)" are used in describing status of the mitigation measures and indicate (**Y**)es, (**N**)o , (**Y**)es and (**N**)o, or (**N**)ot (**A**)pplicable with respect to implementation of the measures. The (**Y/N**) designation means the measure was only partially implemented. Explanatory comments regarding implementation of the measures for the specific projects are provided in the following status reports.

Fall Chinook Salmon

Project: Big Beef Creek Chinook

Sponsors: University of Washington (UW) and Hood Canal Salmon Enhancement Group (HCSEG) with WDFW

Release Class: Fingerling

Hatchery Operations

Specified Mitigation Measures:

m&e #3: Fish health monitoring

m&e #4: Recording of fish production (release data)
m&e #5: NPDES permit effluent monitoring

Status:

m&e #3: (**Y/N**) Certification of brood stocks conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
m&e #4: (**N**) Report not submitted to WDFW; to improve reporting in the future, contract stipulates that continuation of project requires report to be provided.
m&e #5: (**NA**) Not applicable - no NPDES required for project of this size.

Predation

Specified Mitigation Measure:

m&e #1: Recording of fish production (release data)

Status:

m&e #1: (**N**) Report not submitted to WDFW; to improve reporting in the future, continuation of project requires report to be provided.

Competition and Behavior Modification:

Specified Mitigation Measures:

r.a #4: Capture 100% of returning fall chinook to reduce risk of spawning ground space competition with summer chum.
m&e #1: Monitor returning fall chinook that spawn naturally for impact on summer chum.

Status:

r.a #4: (**N**) Some returning chinook spawned in the artificial stream channel adjacent to Big Beef Creek. However, there was no interaction effect since all of extremely low numbers of returning summer chum (from reintroduction project) were utilized as broodstock. Should be closely monitored in future.
m&e #1: (**Y**) Report submitted to WDFW.

Disease Transfer

Specified Mitigation Measures:

r.a #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals.
r.a #2: Follow Co-managers' salmonid disease control policy.
r.a #3: Fish health certification before release.
r.a #4: Release fish in healthy condition.
m&e #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals (same as r.a #1).
m&e #2: Report fish health and condition.

Status:

r.a #1: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
r.a #2: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.
r.a #3: (**N**) Not certified by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
r.a #4: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.
m&e #1: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
m&e #2: (**Y**) Reporting done by WDFW fish pathologists, if needed.

Project: Skokomish R. Chinook (Enhancement Group)
Sponsors: HCSEG/WDFW/Long Live the Kings
Release Classes: Fingerling and Yearling

Hatchery Operations

Specified Mitigation Measures:

m&e #3: Fish health monitoring.
m&e #4: Recording of fish production (release data).
m&e #5: NPDES permit effluent monitoring.

Status:

m&e #3: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Yearling fish health checked prior to release. Fingerling fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
m&e #4: (**N**) Report not submitted to WDFW; to improve reporting in the future, contract stipulates that continuation of project requires report to be provided
m&e #5: (**NA**) Not applicable - no NPDES required for project of this size.

Predation

Specified Mitigation Measure:

m&e #1: Recording of fish production (release data)

Status:

m&e #1: (**N**) Report not submitted to WDFW; to improve reporting in the future, contract stipulates that continuation of project requires report to be provided.

Competition and Behavior Modification:

Specified Mitigation Measure:

m&e #1: Monitor returning fall chinook that spawn naturally for impact on summer chum.

Status:

m&e #1: (**Y**) Potential effects require more information on status of Skokomish summer chum stock.

Disease Transfer

Specified Mitigation Measures:

m&e #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals.

m&e #2: Report fish health and condition.

Status:

m&e #1: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Yearling fish health checked prior to release. Fingerling fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

m&e #2: (**Y**) Reporting done by WDFW fish pathologists, if needed.

Project: Hamma Hamma R. Chinook

Sponsors: HCSEG/WDFW

Release Classes: Fingerling

Hatchery Operations

Specified Mitigation Measures:

r.a. #4: Handling and holding of summer chum brood stock minimized.

r.a. #6: Brood stocking and hatchery operations consistent with provisions of the SCSCI.

m&e #1: Daily recording of numbers captured , disposition and mortalities during adult trapping operations. Provide data reports to WDFW.

m&e #2: Record keeping of brood stocking. Provide reports to WDFW.

m&e #3: Fish health monitoring

m&e #4: Recording of fish production (release data)

m&e #5: NPDES permit effluent monitoring

Status:

r.a. #4: (**Y**) Trapping of returning adult summer chum was effective with low impact.

r.a. #6: (**Y**) Operations consistent with SCSCI.

m&e #1: (**Y**) Records kept and provided to WDFW.

m&e #2: (**Y**) Records kept and provided to WDFW.

m&e #3: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
m&e #4: (**N**) Report not submitted to WDFW; to improve reporting in the future, contract stipulates that continuation of project requires report to be provided.
m&e #5: (**NA**) Not applicable - no NPDES required for project of this size.

Predation

Specified Mitigation Measure:

m&e #1: Recording of fish production (release data)

Status:

m&e #1: (**N**) Report not submitted to WDFW; to improve reporting in the future, contract stipulates that continuation of project requires report to be provided.

Competition and Behavior Modification:

Specified Mitigation Measure:

m&e #1: Monitor returning fall chinook that spawn naturally for impact on summer chum.

Status:

m&e #1: (**Y**) Information submitted to WDFW.

Disease Transfer

Specified Mitigation Measures:

m&e #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals.
m&e #2: Report fish health and condition.

Status:

m&e #1: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
m&e #2: (**Y**) Reporting done by WDFW fish pathologists, if needed.

Project: Johnson Ck. (On Duckabush R.) Chinook

Sponsors: HCSEG/WDFW
Release Classes: Fingerling

Hatchery Operations

Specified Mitigation Measures:

m&e #3: Fish health monitoring.

m&e #4: Recording of fish production (release data).
m&e #5: NPDES permit effluent monitoring.

Status:

m&e #3: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Fingerling fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
m&e #4: (**N**) Report not submitted to WDFW; to improve reporting in the future, contract stipulates that continuation of project requires report to be provided.
m&e #5: (**NA**) Not applicable - no NPDES required for project of this size.

Predation

Specified Mitigation Measure:

m&e #1: Recording of fish production (release data)

Status:

m&e #1: (**N**) Report not submitted to WDFW; to improve reporting in the future, contract stipulates that continuation of project requires report to be provided.

Competition and Behavior Modification:

Specified Mitigation Measure:

m&e #1: Monitor returning fall chinook that spawn naturally for impact on summer chum.

Status:

m&e #1: (**Y**) Information submitted to WDFW.

Disease Transfer

Specified Mitigation Measures:

r.a #1: Monitoring and evaluation of juvenile fish health by fish health professionals.
r.a #2: Follow Co-managers' salmonid disease control policy.
r.a #3: Fish health certification before release.
r.a #4: Release fish in healthy condition.
m&e #1: Monitoring and evaluation of juvenile fish health by fish health professionals (same as r.a #1).
m&e #2: Report fish health and condition.

Status:

r.a #1:(**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
r.a #2: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.
r.a #3: (**N**) Not certified by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
r.a #4: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.

m&e #1: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
m&e #2: (**Y**) Reporting done by WDFW fish pathologists, if needed.

Chinook Salmon

Project: Dungeness Fish Hatchery Chinook
Sponsors: WDFW
Release Classes: Fry, Fingerling

Predation
Specified Mitigation Measure:
m&e #2: Monitor chinook survival rates, distribution within stream and potential predation effects on summer chum.

Status:
m&e #2: (**Y**) Fingerling survival rates monitored by CWT. Distribution within stream may be assessed through Jamestown S'Klallam Tribe's life history studies. Potential predation effects require more information on status of Dungeness summer chum stock.

Coho Salmon

Project: Port Gamble Net Pens Coho
Sponsors: Port Gamble S'Klallam Tribe with WDFW and USFWS
Release Classes: Yearling

Competition and Behavior Modification:
Specified Mitigation Measure:
r.a. #7: Acclimate coho to release site.
Status:
r.a. #7: (**Y**) Coho were acclimated to the Port Gamble site for at least three months before release in 2000 and 2001.

Project Name: Quilcene Net Pens Coho
Sponsors: Skokomish Tribe with WDFW and USFWS
Release Classes: Yearling

Competition and Behavior Modification:
Specified Mitigation Measure:

r.a. #7: Acclimate coho to release site.

Status:

r.a. #7: (**Y**) Coho were acclimated to the Quilcene Bay site for at least three months before release in 2000. High mortalities and holes in net by seals resulted in early release (after less than two weeks in net pen) of undetermined proportion of production in 2001. Measures are being taken to reduce risk of recurrence.

Project: Snow Creek Coho
Sponsor: WDFW
Release Classes: Unfed Fry, Pre-smolts

Predation

Specified Mitigation Measure:

m&e #2: Monitor coho survival rates, distribution within stream and potential predation effects on summer chum.

Status:

m&e #2: (**Y**) Survival rates monitored by CWT and/or otolith marks. Fry releases from RSIs monitored for distribution in stream and at trap at RM 0.8 as smolts. Potential predation effects of coho smolts on summer chum not monitored, but presumed to be minimal due to differential outmigration timing of coho smolts (mid-April through May) vs. summer chum (March-April).

Competition and Behavior Modification:

Specified Mitigation Measure:

m&e #3: Monitor coho survival rates, distribution within stream and potential competition effects on summer chum.

Status:

m&e #3: (**Y**) Survival rates monitored by CWT and/or otolith marks. Fry releases from RSIs monitored for distribution in stream and at trap at RM 0.8 as smolts. Potential predation effects of coho smolts on summer chum not monitored, but presumed to be minimal due to differential outmigration timing of coho smolts (mid-April through May) vs. summer chum (March-April).

Pink Salmon

Project: Hoodsport Fish Hatchery Pink
Sponsor: WDFW
Release Classes: Fed Fry

Predation

Specified Mitigation Measure:

r.a. #4: Release pink fry after April 1 to reduce risk of predator attraction to summer chum fry in estuarine areas.

Status:

r.a #4: (**Y**) Pink fry released after April 1.

Competition and Behavior Modification:

Specified Mitigation Measure:

r.a.#1&#2: No pink release (fed or unfed fry) before April 1 to reduce risk of food source competition and adverse behavior modification effects on summer chum in estuarine areas.

Status:

r.a. #1&#2: (**Y**) All pink fry released after April 1.

Project: Dungeness Fish Hatchery Fall Pink

Sponsor: WDFW

Release Classes: Fed Fry

Hatchery Operations

Specified Mitigation Measures:

r.a #1: Minimize handling and delay of summer chum by weir used to capture fall pinks.

r.a. #2: Personnel operating weir are properly trained in handling of summer chum.

r.a. #3: Monitor weir continuously.

r.a. #4: Hold summer chum captured at weir no longer than four hours before passing upstream.

r.a. #5: Place and remove weir with no impact on spawning activities, distribution or redds of summer chum.

Status:

r.a. #1-5: (**NA**) Low flow conditions prevented placement and operation of weir in 1999. Weir not used in non-pink (even-numbered) years such as 2000.

Competition and Behavior Modification:

Specified Mitigation Measure:

r.a. #6: Release pink fry after April 1.

Status:

r.a. #6: (**Y**) Pink fry released after April 1.

Fall Chum Salmon

Project: Hoodsport Fish Hatchery Fall Chum

Sponsor: WDFW

Release Classes: Fed Fry

Predation

Specified Mitigation Measure:

r.a. #4: Release fall chum fry after April 1 to reduce risk of predator attraction to summer chum fry in estuarine areas.

Status:

r.a #4: (**Y**) Fall chum fry released after April 1.

Competition and Behavior Modification:

Specified Mitigation Measures:

r.a.#1&#2: No fall chum release (fed or unfed fry) before April 1 to reduce risk of food source competition and adverse behavior modification effects on summer chum in estuarine areas.

Status:

r.a. #1&#2: (**Y**) All fall chum fry released after April 1.

Project: McKernan Fish Hatchery Fall Chum

Sponsor: WDFW

Release Classes: Fed Fry

Predation

Specified Mitigation Measure:

r.a. #4: Release fall chum fry after April 1 to reduce risk of predator attraction to summer chum fry in estuarine areas.

Status:

r.a #4: (**Y**) Fall chum fry released after April 1.

Competition and Behavior Modification:

Specified Mitigation Measures:

r.a.#1&#2: No fall chum release (fed or unfed fry) before April 1 to reduce risk of food source competition and adverse behavior modification effects on summer chum in estuarine areas.

Status:

r.a. #1&#2: (**Y**) All fall chum fry released after April 1.

Project: Sweetwater Creek Fall Chum

Sponsor: HCSEG/WDFW

Release Classes: Unfed Fry

Hatchery Operations

Specified Mitigation Measures:

m&e #3: Fish health monitoring

m&e #4: Recording of fish production (release data)

m&e #5: NPDES permit effluent monitoring

Status:

m&e #3: (**Y/N**) Certification of brood stocks conducted in WDFW Virology Lab. Fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

m&e #4: (**N**) Report not submitted to WDFW; to improve reporting in the future, contract stipulates that continuation of project requires report to be provided.

m&e #5: (**NA**) Not applicable - no NPDES required for project of this size.

Predation

Specified Mitigation Measure:

m&e #1: Recording of fish production (release data)

Status:

m&e #1: (**N**) Report not submitted to WDFW; to improve reporting in the future, contract stipulates that continuation of project requires report to be provided.

Competition and Behavior Modification:

Specified Mitigation Measures:

r.a. #2: No fall chum release before April 1 to reduce risk of food source competition and adverse behavior modification effects on summer chum in estuarine areas.

m&e #2: Monitor timing of emergence and numbers of fry released

Status:

r.a. #2: (**Y**) All fall chum fry released after April 1.

m&e #2: (**Y**) Timing and numbers of fry released monitored but not reported.

Disease Transfer

Specified Mitigation Measures:

r.a #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals.

r.a #2: Follow Co-managers' salmonid disease control policy.

r.a #3: Fish health certification before release.

r.a #4: Release fish in healthy condition.

m&e #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals (same as r.a #1).

m&e #2: Report fish health and condition.

Status:

r.a #1:(**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
r.a #2: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.
r.a #3: (**N**) Not certified by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
r.a #4: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.
m&e #1: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
m&e #2: (**Y**) Reporting done by WDFW fish pathologists, if needed.

Project: Unnamed Creek 14.0124 (Grimm) Fall Chum
Sponsor: HCSEG/WDFW
Release Classes: Unfed Fry

Hatchery Operations

Specified Mitigation Measures:

m&e #3: Fish health monitoring
m&e #4: Recording of fish production (release data)
m&e #5: NPDES permit effluent monitoring

Status:

m&e #3: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
m&e #4: (**N**) Report not submitted to WDFW; to improve reporting in the future, contract stipulates that continuation of project requires report to be provided.
m&e #5: (**NA**) Not applicable - no NPDES required for project of this size.

Predation

Specified Mitigation Measure:

m&e #1: Recording of fish production (release data)

Status:

m&e #1: (**N**) Report not submitted to WDFW; to improve reporting in the future, contract stipulates that continuation of project requires report to be provided.

Competition and Behavior Modification:

Specified Mitigation Measures:

r.a. #2: No fall chum release before April 1 to reduce risk of food source competition and adverse behavior modification effects on summer chum in estuarine areas.

m&e #2: Monitor timing of emergence and numbers of fry released

Status:

r.a. #2: (**Y**) All fall chum fry released after April 1.

m&e #2: (**Y**) Timing and numbers of fry released monitored but not reported.

Disease Transfer

Specified Mitigation Measures:

r.a #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals.

r.a #2: Follow Co-managers' salmonid disease control policy.

r.a #3: Fish health certification before release.

r.a #4: Release fish in healthy condition.

m&e #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals (same as r.a #1).

m&e #2: Report fish health and condition.

Status:

r.a #1:(**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

r.a #2: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.

r.a #3: (**N**) Not certified by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

r.a #4: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.

m&e #1: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

m&e #2: (**Y**) Reporting done by WDFW fish pathologists, if needed.

Project: Unnamed Creek 14.0124 (Koopman/Mulberg) Fall Chum

Sponsor: HCSEG/WDFW

Release Classes: Unfed Fry

Hatchery Operations

Specified Mitigation Measures:

m&e #3: Fish health monitoring

m&e #4: Recording of fish production (release data)

m&e #5: NPDES permit effluent monitoring

Status:

m&e #3: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
m&e #4: (**N**) Report not submitted to WDFW; to improve reporting in the future, contract stipulates that continuation of project requires report to be provided.
m&e #5: (**NA**) Not applicable - no NPDES required for project of this size.

Predation

Specified Mitigation Measure:

m&e #1: Recording of fish production (release data)

Status:

m&e #1: (**N**) Report not submitted to WDFW; to improve reporting in the future, contract stipulates that continuation of project requires report to be provided.

Competition and Behavior Modification:

Specified Mitigation Measures:

r.a. #2: No fall chum release before April 1 to reduce risk of food source competition and adverse behavior modification effects on summer chum in estuarine areas.
m&e #2: Monitor timing of emergence and numbers of fry released

Status:

r.a. #2: (**Y**) All fall chum fry released after April 1.
m&e #2: (**Y**) Timing and numbers of fry released monitored but not reported.

Disease Transfer

Specified Mitigation Measures:

r.a #1: Monitoring and evaluation of juvenile fish health by fish health professionals.
r.a #2: Follow Co-managers' salmonid disease control policy.
r.a #3: Fish health certification before release.
r.a #4: Release fish in healthy condition.
m&e #1: Monitoring and evaluation of juvenile fish health by fish health professionals (same as r.a #1).
m&e #2: Report fish health and condition.

Status:

r.a #1:(**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
r.a #2: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.
r.a #3: (**N**) Not certified by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

r.a #4: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.
m&e #1: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
m&e #2: (**Y**) Reporting done by WDFW fish pathologists, if needed.

Project: Unnamed Creek 14.0136 (Adams) Fall Chum
Sponsor: HCSEG/WDFW
Release Classes: Unfed Fry

Hatchery Operations
Specified Mitigation Measures:
m&e #3: Fish health monitoring
m&e #4: Recording of fish production (release data)
m&e #5: NPDES permit effluent monitoring
Status:
m&e #3: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
m&e #4: (**N**) Report not submitted to WDFW; to improve reporting in the future, contract stipulates that continuation of project requires report to be provided.
m&e #5: **(NA**) Not applicable - no NPDES required for project of this size.

Predation
Specified Mitigation Measure:
m&e #1: Recording of fish production (release data)
Status:
m&e #1: (**N**) Report not submitted to WDFW; to improve reporting in the future, contract stipulates that continuation of project requires report to be provided.

Competition and Behavior Modification:
Specified Mitigation Measures:
r.a. #2: No fall chum release before April 1 to reduce risk of food source competition and adverse behavior modification effects on summer chum in estuarine areas.
m&e #2: Monitor timing of emergence and numbers of fry released
Status:
r.a. #2: (**Y**) All fall chum fry released after April 1.
m&e #2: (**Y**) Timing and numbers of fry released monitored but not reported.

Disease Transfer

Specified Mitigation Measures:

r.a #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals.
r.a #2: Follow Co-managers' salmonid disease control policy.
r.a #3: Fish health certification before release.
r.a #4: Release fish in healthy condition.
m&e #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals (same as r.a #1).
m&e #2: Report fish health and condition.

Status:

r.a #1:(**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
r.a #2: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.
r.a #3: (**N**) Not certified by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
r.a #4: (**Y**) Ensured by WDFW fish pathologists, if fish health checks needed.
m&e #1: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
m&e #2: (**Y**) Reporting done by WDFW fish pathologists, if needed.

Steelhead

Project: Skokomish R. Steelhead

Sponsor: WDFW
Release Classes: Yearling

Predation

Specified Mitigation Measure:

r.a. #1: No yearling releases before April 15 to reduce risk of predation on summer chum fry. Pursue coefficient of variation for smolt length not to exceed 10%.
r.a. #2: No release of fry, fingerlings or sub-yearlings into summer chum streams.
r.a. #3: Volitionally-migrating and acclimated releases.

Status:

r.a. #1: (**Y**) Yearlings released after April 15.
r.a. #2: (**Y**) No fry, fingerlings or sub-yearlings released.
r.a. #3: (**Y**) Volitionally-migrating and acclimated yearlings released.

Project: Dosewallips R. Steelhead

Sponsor: WDFW
Release Classes: Yearling

Predation

Specified Mitigation Measure:

r.a. #1: No yearling releases before April 15 to reduce risk of predation on summer chum fry. Pursue coefficient of variation for smolt length not to exceed 10%.
r.a. #2: No release of fry, fingerlings or sub-yearlings into summer chum streams.
r.a. #3: Volitionally-migrating and acclimated releases.

Status:

r.a. #1: (**Y**) Yearlings released after April 15.
r.a. #2: (**Y**) No fry, fingerlings or sub-yearlings released.
r.a. #3: (**Y/N**) Volitionally-migrating yearlings released. No facilities for acclimation currently exist.

Project: Duckabush R. Steelhead
Sponsor: WDFW
Release Classes: Yearling

Predation

Specified Mitigation Measure:

r.a. #1: No yearling releases before April 15 to reduce risk of predation on summer chum fry. Pursue coefficient of variation for smolt length not to exceed 10%.
r.a. #2: No release of fry, fingerlings or sub-yearlings into summer chum streams.
r.a. #3: Volitionally-migrating and acclimated releases.

Status:

r.a. #1: (**Y**) Yearlings released after April 15.
r.a. #2: (**Y**) No fry, fingerlings or sub-yearlings released.
r.a. #3: (**Y/N**) Volitionally-migrating yearlings released. No facilities for acclimation currently exist.

Project: Dungeness R. Steelhead
Sponsor: WDFW
Release Classes: Yearling

Predation

Specified Mitigation Measure:

r.a. #1: No yearling releases before April 15 to reduce risk of predation on summer chum fry. Pursue coefficient of variation for smolt length not to exceed 10%.
r.a. #2: No release of fry, fingerlings or sub-yearlings into summer chum streams.

r.a. #3: Volitionally-migrating and acclimated releases.

Status:

r.a. #1: (**Y**) Yearlings released after April 15.

r.a. #2: (**Y**) No fry, fingerlings or sub-yearlings released.

r.a. #3: (**Y**) Volitionally-migrating yearlings released. Fish are acclimated at Dungeness Hatchery before release.

Project: Hamma Hamma R. Steelhead

Sponsors: HCSEG/Long Live the Kings/WDFW/NMFS

Release Classes: Two-year smolt

Hatchery Operations

Specified Mitigation Measures:

r.a. #4: Handling and holding of summer chum brood stock minimized.

r.a. #6: Brood stocking and hatchery operations consistent with provisions of the SCSCI.

m&e #1: Daily recording of numbers captured , disposition and mortalities during adult trapping operations. Provide data reports to WDFW.

m&e #2: Record keeping of brood stocking. Provide reports to WDFW.

m&e #3: Fish health monitoring

m&e #4: Recording of fish production (release data)

m&e #5: NPDES permit effluent monitoring

Status:

r.a. #4: (**Y**) Timing and approach (collecting portion of eggs from steelhead redds) does not affect summer chum.

r.a. #6: (**Y**) Operations consistent with SCSCI.

m&e #1: (**Y**) Records kept and provided to WDFW.

m&e #2: (**Y**) Records kept and provided to WDFW.

m&e #3: (**Y/N**) Certification of brood stock conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.

m&e #4: (**Y**) Report submitted to WDFW.

m&e #5: (**NA**) Not applicable - no NPDES required for project of this size.

Predation

Specified Mitigation Measure:

r.a. #1: No yearling releases before April 15 to reduce risk of predation on summer chum fry. Pursue coefficient of variation for smolt length not to exceed 10%.

r.a. #2: No release of fry, fingerlings or sub-yearlings into summer chum streams.

r.a. #3: Volitionally-migrating and acclimated releases.

m&e #1: Recording of fish production (release data)

Status:

r.a. #1: (**Y/N**) First release year was 2000. Two-year smolts were released after April 15. However, some sub-yearlings and yearlings escaped from natural pond into John Creek. Pond has since been modified to reduce risk of juvenile escapement.
r.a. #2: (**Y/N**) No fry, fingerlings or sub-yearlings were intended for release as part of program. However, some sub-yearlings and yearlings escaped from natural pond into John Creek. Pond has since been modified to reduce risk of juvenile escapement.
r.a. #3: (**Y**) Volitionally-migrating and acclimated yearlings released. However, as noted above, some sub-yearlings and yearlings escaped from natural pond into John Creek
m&e #1: (**Y**) Report submitted to WDFW.

Competition and Behavior Modification:

Specified Mitigation Measure:

m&e #3: Monitor smolts resulting from planting of indigenous fry and fingerlings for survival rates and for distribution within stream. Also, evaluate potential competition effects on summer chum.

Status:

m&e #3: (**NA**) No fry or fingerling steelhead intentionally released in stream.

Disease Transfer

Specified Mitigation Measures:

m&e #1: Monitoring and evaluation of brood stock and juvenile fish health by fish health professionals.
m&e #2: Report fish health and condition.

Status:

m&e #1: (**Y/N**) Certification of brood stocks conducted in WDFW Virology Lab. Juvenile fish health was not checked by WDFW fish pathologists; however, no fish health problems occurred which required monitoring.
m&e #2: (**Y**) Reporting done by WDFW fish pathologists, if needed.

APPENDIX REPORT 4
HARBOR SEAL PREDATION ON HOOD CANAL SUMMER CHUM

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Since the fall of 1998, the Washington Department of Fish and Wildlife (WDFW) has been evaluating the potentially negative effects of predation by pinnipeds on the recovery of ESA-listed summer chum salmon runs in Hood Canal. These efforts continued through the fall of 2000 and preliminary results from 1998 and 1999 are presented here. Hood Canal became the focus of these efforts because of the isolated nature of the system and the presence of abundant harbor seal populations along with a salmonid stock of concern, namely summer chum.

Surface observations were used to document harbor seal predation on returning adult salmon at the Quilcene, Dosewallips, Duckabush, and Hamma Hamma river systems in Hood Canal. Each observation site was sampled randomly three days each week and scheduled in advance. Each daily observation period was also randomly scheduled to either begin 15 minutes after sunrise or end 45 minutes before sunset to allow adequate ambient light for observations. Observations were made from either a 16 foot tower blind (Dosewallips, Duckabush and Hamma Hamma) or ground vantage points (Quilcene Bay), which allowed viewing of predation events off the mouths of each river as well as most areas just upstream from the river mouth.

At each site, the observation period lasted a total of 6 hours from arrival. The focus of the observer was to cover all areas at each site where predation by seals was possible. Observers documented any predation or foraging event and noted time, exact location, number of seals involved, species of salmon (if possible), and duration of each predation event. Most predations occurred at a fair distance from the observer, lasted only a few seconds, were mostly underwater and, in general, provided little information that allowed an observer to determine salmon species. On those occasions when a predation event was observed under good conditions, observers were able to identify the species of salmonid being killed with a level of confidence. Unfortunately, the number of predations observed under optimal conditions was small. Additionally, differences in size, color and life history of each salmonid species are variable and the assumption that each species is equally identifiable is not likely.

Estimates of salmonid predation were determined using a two-stage sampling estimator and predation rates calculated over a 24-hour period based on day and night observation data. Due to uncertainties associated with allocation of salmonid predations to a particular species, assumptions had to be made with regard to any selection seals may have for or against summer chum in relation to other salmonid species. Estimates of predation are focused

on determining the impact on summer chum and are thus reflective of only the time window during which summer chum runs were present in each system.

For these analyses, a scenario of proportional allocation based on relative salmon abundances was used. The proportional allocation scenario assumes there is no selection by harbor seals for or against summer chum relative to other salmonids, and the percentage of summer chum with respect to total salmonid abundance will be used to allocate the number of predations on summer chum. This scenario is the most objective, however, the role other more numerous salmon species (e.g. odd year pink salmon) play as a buffer to seal predation on summer chum is unclear.

Results indicate a small number of harbor seals (most likely 2-6 individuals at each river) are killing hundreds of Hood Canal summer chum salmon annually. At each river, these salmon kills are of returning adult fish on or near spawning grounds. Estimated harbor seal predation ranged from 2-29 percent of the summer chum run in each river. Significance of these predation losses to the recovery of Hood Canal summer chum runs needs to be determined and possible mitigation measures developed.

Table 1. Estimates of harbor seal predation on salmonids during the 1998 and 1999 summer chum run at four sites in Hood Canal, Washington. The percentage of salmonids consumed, abundance counts, estimates of the number of each species consumed and the corrected runsize.

	% Salmon	Salmonid	Summer Chum	Coho	Pink	Chinook	Fall Chum
Quilcene Bay							
1998 Predation [1]	**3.56**	**414**	**56**	**359**	**0**	**0**	**0**
1998 Spawner Count		11,225	1,504	9,719	0	0	2
1998 Runsize		11,639	1,560	10,078	0	0	2
1999 Predation [1]	**1.57**	**112**	**46**	**62**	**4**	**0**	**0**
1999 Abundance		7,013	2,859	3,889	265	0	0
1999 Runsize		7,125	2,905	3,951	269	0	0
Dosewallips River							
1998 Predation [1]	**29.15**	**202**	**120**	**81**	**0**	**0**	**0**
1998 Spawner Count		490	292	198	0	0	0
1998 Runsize		692	412	279	0	0	0
1999 Predation [1]	**7.68**	**269**	**29**	**5**	**235**	**0**	**0**
1999 Abundance		3,233	351	60	2,822	0	0
1999 Runsize		3,502	380	65	3,057	0	0
Duckabush River							
1998 Predation [1]	**9.50**	**50**	**23**	**21**	**0**	**0**	**7**
1998 Spawner Count		480	216	198	0	0	66
1998 Runsize		530	239	219	0	0	73
1999 Predation [1]	**8.88**	**370**	**9**	**4**	**356**	**0**	**0**
1999 Abundance		3,794	93	45	3,656	0	0
1999 Runsize		4,164	102	49	4,012	0	0
Hamma Hamma R.							
1998 Predation [1]	**6.82**	**22**	**7**	**14**	**0**	**0**	**2**
1998 Spawner Count		306	97	187	0	0	22
1998 Runsize		328	104	201	0	0	24
1999 Predation [1]	**2.48**	**190**	**6**	**17**	**153**	**15**	**0**
1999 Abundance		7,488	234	660	6,014	580	0
1999 Runsize		7,678	240	677	6,167	595	0

[1] Salmonid estimates are extrapolated from the number of predations observed at each site. Predation estimates for each individual species are derived from the salmonid estimate using the "proportional allocation" scenario.