2012 MANAGEMENT FRAMEWORK PLAN
AND
SALMON RUNS' STATUS
FOR THE
STRAIT OF JUAN DE FUCA REGION

Joint Report by:

Point No Point Treaty Council
Port Gamble S'Klallam Tribe
Jamestown S'Klallam Tribe
Lower Elwha Klallam Tribe
Makah Tribe
and
Washington Department of Fish and Wildlife

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Contents

1. Introduction

1.1 General

This report has been prepared by the Point No Point Treaty Council (for the Port Gamble and Jamestown S'Klallams) and has been reviewed and agreed to by the Washington Department of Fish and Wildlife, the Lower Elwha Klallam Tribe, and the Makah Tribe. It is intended to fulfill the parties' reporting requirements under the provisions of Section 5.2 of the Puget Sound Salmon Management Plan. This report is intended to facilitate the terminal area management of Strait of Juan de Fuca-origin salmon returning in 2012 and to document the forecasting and assessment methodologies used. This report covers all species of salmon (except steelhead) for Strait of Juan de Fuca Tributaries. The Preseason Management Framework (Section 4.0) documents the parties' preseason agreement for the conduct of SJF fisheries according to the 2012-13 State/Tribal Agreed to Fisheries Document, NWIFC, April 2012.

This preseason management framework plan outlines the forecasted total abundance for each salmon species by management unit (except fall chum salmon are forecasted by natural/hatchery origins). Detailed information concerning the methods used to forecast the abundance of each run is presented in Appendix A. Information concerning the methods used to obtain inseason estimates of abundance is presented in Appendix B. Also included in this report are agreed-upon escapement goals, expected escapements (under the parties' management framework) for each management unit (natural and hatchery, primary and secondary), expected harvests, test and evaluation fishery requirements, and preseason and inseason run assessment methods.

The framework outlines the anticipated measures to be taken in Strait of Juan de Fuca near-terminal, terminal, and extreme terminal commercial and recreational fisheries for the harvest and protection of the salmon runs returning to this region. The framework also includes contingency measures contemplated by the parties for use inseason, should the need arise.

1.2 Summary of the 2012 Runs and Fisheries

All salmon runs returning to Strait of Juan de Fuca rivers and streams will be managed on the basis of natural production (except coho salmon in the Elwha River and Dungeness River and Bay, and Chinook salmon returning to the Elwha River). Of the various salmon runs, only the coho returning to the Dungeness River and the Elwha River are expected to be of sufficient abundance to support directed fisheries in the terminal areas. However, all runs may be harvested incidentally in fisheries directed at other runs and/or species in pre-terminal and terminal areas. During 2012 preseason fisheries planning, measures were taken to reduce impacts to Puget Sound Chinook salmon and Hood Canal/Strait of Juan de Fuca summer chum salmon, both currently listed as threatened under provisions of the Endangered Species Act.

Preseason forecasts of abundance and expected catches are provided as a guide for fisheries and conservation planning (Tables 3.1 - 3.4). Actual run sizes entering Puget Sound may deviate from these forecasts because of statistical variability, unusual rates of survival (high or low), unanticipated changes in exploitation rates in prior fisheries, or some combination of these and other factors. In most cases, the escapement goals reflect the currently accepted estimates of escapement abundance necessary to provide for future maximum sustainable harvest (MSH) under average progeny survival conditions. For summer chum salmon, the goals are based on the target escapement rates established in the *Summer Chum Salmon Conservation Initiative* (SCSCI). For Chinook salmon, the targets are those established in the *Puget Sound Chinook Harvest Management Plan* (PSCHMP). For coho salmon returning to natural spawning areas, the escapement target is that which results from a rate of escapement equal to, or higher than, the minimum escapement rate allowable (60%) under the stepped exploitation rate management approach used for Strait of Juan de Fuca natural (primary) coho for the 2012 forecasted recruitment. Expected escapement is the preseason forecast minus expected harvest from fisheries consistent with the parties' preseason planned management framework.

Of the salmon runs returning to Strait of Juan de Fuca tributaries in 2012, only Dungeness River and Elwha River origin coho are expected to have a significant harvestable surplus available for directed fisheries. Therefore, the parties' management framework has focused on the need to provide opportunity for limited fisheries, while striving to maintain protective and rehabilitative measures for Strait of Juan de Fuca salmon returning to natural spawning areas (See Section 4.0 of this report).

2. 2012 Salmon Fishery Management Periods

Table 2-1. Strait of Juan de Fuca Salmon Management Periods [(1)]

Area	Chinook	Summer Chum	Coho	E. Fall Chum	L. Fall Chum	Winter Steelhead
Areas 4B,5,6C	06/24-08/11	08/01-09/30	08/12-10/06	10/07-11/10	11/11-12/01	12/02-03/30
Area 6	07/01-08/25	08/01-09/30	08/26-10/06	10/07-11/10	11/11-12/01	12/02-03/30
6D & Dungen. I	07/22-09/15	---	09/16-10/27	10/28-12/01	---	12/02-03/30
Dungeness II	08/05-09/22	---	09/23-11/03	11/04-12/08	---	12/09-04/13
Elwha	07/22-09/15	---	09/16-11/03	11/04-12/08	---	12/09-04/13
Discovery-Sequim Bays	---	09/16-10/20	10/21-12/01	---	---	12/02-05/04
Hoko-Sekiu	09/09-11/10	---	09/30-11/10	11/11-12/08	---	12/09-03/30
Misc. SJF Tributaries	09/09-11/10	---	09/30-11/10	11/11-12/08	12/02-12/31	12/02-04/13

Notes: Region I of the Dungeness River (Dung. I) extends from the Schoolhouse Bridge, downstream to the river mouth. It is located in the area of tidal influence, and therefore it is managed concurrent with the rest of Dungeness Bay (Area 6D).

(1) Management periods based on the methods of Nick Lampsakis, PNPTC and the *Puget Sound Salmon Management Periods and Their Derivations*, 1990. Shaded portions in the above table indicate no adjustment to eliminate overlaps/gaps was applied.

The management periods defined above for each area describe the time intervals during which regulatory actions will be directed to meet the conservation and allocation requirements for adult salmon of each species, taking into consideration the catches (actual and/or expected) of that species outside its management period. Since many runs extend over lengthy periods of time, with only small portions of the runs available at the extreme ends of the annual entry pattern, it is impractical to try to take management actions directed at these stocks throughout their entire entry, while continuing to simultaneously manage fisheries on other species and stocks. In managing fisheries, the parties shall attempt to apportion the harvest throughout each management period in order to achieve catch and escapement from all segments of each run.

The above management periods have been derived by the following steps: First, for each area where that species is found, the central 80% of the average entry pattern for each species was used as the "base" management period. The source of this information comes from a 1995 analysis of entry pattern information based on historical harvest and spawner entry, which was reviewed by the affected parties. Next, "overlaps" and "gaps" between the periods were eliminated, generally by halving. In order to facilitate weekly fisheries management actions, the resulting "start" and "end" dates for each period were often adjusted to begin on the nearest Sunday and end on a Saturday. Finally, management periods should not be viewed as inflexible and may be adjusted inseason by agreement of the parties, on the basis of inseason information indicating a shift in run-timing for a particular stock.

3. Summary of Preseason Forecasts, Expected Harvests, and Escapements

3.1 Summer/Fall Chinook Salmon

Table 3-1. Preseason Forecasts and Expected Harvests and Escapements for Strait of Juan de Fuca Chinook Salmon Management / Production Units, 2012 (values based on FRAM run #1512)

FISHERY		Dungeness (N)	Elwha (N+H)	Hoko (N)	Total
Canada		948	2,669	296	3,912
Alaska	Ntrty	153	432	211	797
S. Of Falcon Ocean	Ntrty	0	0	0	0
N.Flc. Ocean Troll:	NTrty	0	1	0	2
	Trty	3	9	0	12
N.Flc. Oc. & B-10 Spt	Ntrty	0	0	1	1
Pgt Snd Troll	Trty	10	27	5	42
Pgt Snd 6 Sport	Ntry	3	10	16	29
Pgt Snd 5 Sport	Ntry	10	27	47	84
Pgt Snd 7 Sport	Ntry	3	8	0	11
Pgt Snd 8-13 Sport	Ntry	12	34	0	46
Strait Net	Trty	2	4	6	12
San Juans Net	Ntrty	2	6	0	8
	Trty	10	27	0	36
Out-of-Region net:	NTrty	1	4	0	6
	Trty	4	13	0	17
Local Terminal Net:	NTrty	1	0	0	1
	Trty	1	0	0	1
Freshwater Sport: \1	NTrty	0	0	0	0
Freshwater Net:	Trty	0	4	0	4
Total Marine Catch		1,163	3,271	583	5,017
Extreme Term. Catch		0	4	0	4
TOTAL CATCH		1,163	3,275	583	5,021
Escapement (from TAMMs)		656	1,904	2,118	4,678
TOTAL ABUNDANCE		1,819	5,179	2,701	9,699
Total Exploitation Rate		0.639	0.632	0.216	0.518
ER in S.U.S. Fisheries		0.034	0.034	0.028	0.032

The abundance of any runs returning to SJF rivers other than the Dungeness, Elwha, and Hoko is quite uncertain. Estimates of pre-terminal harvests and terminal run sizes are based on FRAM run #1512. The initial Dungeness and Elwha forecasts were for Chinook salmon expected to return to the terminal area. Methods used to forecast the Dungeness, Elwha and Hoko River runs are further detailed in Appendices A-1 through A-3 of this report.

In 1999, Puget Sound Chinook salmon were listed as threatened as defined by NMFS (50 CFR part 424) and ESA Section 4(d). The Dungeness and Elwha rivers are included in this ESU and are essential to recovery. Protective measures include no terminal area fisheries directed at Chinook salmon in these systems.

Escapement goals are those outlined in the *Puget Sound Chinook Harvest Management Plan*, which given the forecasted 2012 abundance requires that the total southern U.S. exploitation rate be limited to less than 10%. Methods used to estimate the expected escapement and escapement distribution after anticipated pre-spawning mortalities and broodstock removals in the Elwha River are detailed in Appendix A-1. However, the expected escapement listed in Table 3-1 for Elwha River Chinook was generated from FRAM run #1512, and differs slightly from the estimate in Appendix A-1. The expected escapement in the Hoko River includes any brood take by the Makah Tribe for in-river run augmentation. In all cases, no harvestable surplus is indicated under the current exploitation rate based management approach; therefore no commercial or recreational fisheries directed at Chinook are anticipated in the extreme terminal areas.

3.2 Summer Chum Salmon

Table 3-2. Preseason Forecasts and Expected Harvests and Escapements for Strait of Juan de Fuca Summer Chum Salmon Management / Production Units, 2012

Management Unit	Forecast Type	Total Recruits	CDN Harvest	WA Pre-terminal Harvest	Expected Escapement	Escapement Rate Target (1)
Port Townsend	4yr Avg.	1,093	13	17	997	91.2% of total recruits
Discovery Bay	4yr Avg.	2,282	27	35	2,081	91.2% of total recruits
Sequim Bay	4yr Avg.	2,540	31	39	2,316	91.2% of total recruits
Totals		5,915	71	91	5,394	

(1) Escapement rate target is from the Base Conservation Regime in the SCSCI.

The methods used to develop the 2012 forecasts of summer chum salmon returning to the streams of Discovery Bay and Sequim Bay are detailed in Appendix A-4 of this report. The escapement rate targets of the Base Conservation Regime (BCR) of the Summer Chum Salmon Conservation Initiative are average escapements that would result from the application of the exploitation rate based regime. The 2012 summer chum run was forecasted as total recruits to all fisheries and escapement. The forecasted abundance estimates are shown in Table 3.2 and exceed the critical abundance threshold for each Management Unit (Table A-4-b).

In 1999, the Hood Canal/Admiralty Inlet/Strait of Juan de Fuca ESU of summer-run chum salmon was listed as threatened by NMFS (50 CFR part 223) and the ESA Section 4(d). The Hood Canal/Admiralty Inlet/Strait of Juan de Fuca ESU includes the tributaries of Sequim Bay, Discovery Bay, and the Dungeness River. While the volume of anticipated recruits exceeds the currently established recovery thresholds for these populations, in accordance with the co-managers’ recovery plan, no additional harvest will be planned or anticipated.

3.3 Coho Salmon

The coho salmon runs returning to Strait of Juan de Fuca tributaries consist of several small component natural runs in all river systems, as well as hatchery-supported returns to the Elwha and Dungeness rivers. The Dungeness and Elwha River origin runs are the only ones that were predicted to have harvestable numbers of coho salmon sufficient to support directed fisheries in the terminal and extreme terminal areas in 2012. Other runs, while indicating a harvestable surplus in the aggregate, are composed of numerous small components.

Table 3-3. Preseason Forecasts and Expected Harvests and Escapements for Strait of Juan de Fuca Coho Salmon Management / Production Units, 2012

Fishery	Miscellaneous Natural		Elwha River	Dungeness River	Subtotals		Total
	Eastern Natural	Western Natural	Aggregate (1)	Aggregate (1)	Natural	Hatchery & Sec. Natural	
Recruits	2,690	9,979	7,569	11,197	12,669	18,766	31,435
Canada	9	37	117	197	46	314	360
Alaska	14	52	38	56	66	94	160
S.Falcon Tr/Rec	7	29	25	39	36	64	100
N.Falcon Tr/Rec	97	358	379	585	455	964	1,419
P.S. Troll	1	2	1	2	3	3	6
Strait Rec.	163	602	690	1,076	765	1,766	2,531
SJI Rec.	0	0	0	0	0	0	0
Admiralty Rec.	3	9	6	10	12	16	28
N. Sound Rec.	0	0	0	0	0	0	0
S. Sound Rec.	1	2	1	2	3	3	6
Hood Canal Rec.	0	0	0	0	0	0	0
Strait Net	35	130	91	134	165	225	390
San Juans Net	5	19	12	20	24	32	56
Admiralty Net	0	0	0	0	0	0	0
No. Sound Net	0	1	0	1	1	1	2
So. Sound Net	2	6	3	6	8	9	17
Hood Canal Net	7	27	17	28	34	45	79
SJF Rivers Rec.	0	0	0	350	0	350	350
6D Net	0	0	0	4,139	0	4,139	4,139
Elwha/Dungeness Net	0	0	0	0	0	0	0
Miscell. Net	0	9	0	0	9	0	9
Mgmt Unit Hrvst	344	1,283	1,380	6,645	1,627	8,025	9,652
Mgmt Unit Exp. Escapement	2,346	8,696	6,187	4,552	11,042	10,741	21,783
Min. Escap. Target	1,614	5,987	845	727	7,601	1,572	9,173

(1) For 2012, the Elwha R. "pre-season Aggregate" is composed of 5% secondary wild, and 95% hatchery coho salmon. The Dungeness R. "pre-season Aggregate" is composed of 10% secondary wild and 90% hatchery coho salmon.

Methods used to develop the coho forecasts for the 2012 season are summarized in Appendices A-5 through A-7 of this report. The values in Table 3-3 are from preseason FRAM run # 1229, with the expected harvest numbers referring to total anticipated harvests from both incidental and targeted fisheries. The tribal and state co-managers considered the significantly lower interceptions in Canadian fisheries in recent years and structured the preseason management framework to achieve a total exploitation rate of less than 40% for

Strait of Juan de Fuca “primary” production units, which are managed for wild coho salmon. The escapement goals for aggregated management units are those necessary to meet the parties' agreed-upon enhanced production.

3.4 Fall Chum Salmon

3.4.1 Natural Fall Chum Salmon

Methods used to develop the forecasts of fall-timed chum salmon returning to the Strait of Juan de Fuca streams in 2012 are detailed in Appendix A-8 of this report. The final forecast for 2012 is the average of the forecast results for each individual unit obtained by PNPTC and WDFW using different forecasting methods, shown in Appendix A-8 of this report. The expected harvests refer to the total incidental catch from these runs during pre-terminal and terminal area fisheries directed at other species and stocks. For 2012, no directed fishery is anticipated in the terminal or extreme terminal areas. The escapement goals are based on the overall escapement goal of 3,550 fall chum salmon for the region, as re-apportioned in 1987 on the basis of relative stock strength. These escapement goals are treated as interim, pending the development of more accurate escapement targets.

Table 3-4. Preseason Forecasts for Strait of Juan de Fuca Natural Fall Chum Salmon Management / Production Units, 2012

Production Unit	"4B" Run	Escapement Goal
Dungeness R.	126	500
Deep Creek.	126	500
Pysht River	412	1,650
Miscellaneous	233	900
Totals	897	3,550

4. Preseason Management Framework

4.1 2012 Harvest Management Measures and Expected Fisheries

In 2012, the condition of the salmon runs returning to the Strait of Juan de Fuca terminal areas requires that harvest management plans be conservative in nearly all respects. The expected 2012 returns of most Strait of Juan de Fuca salmon runs are very low. Only coho salmon returning to the Elwha and Dungeness areas are expected to be sufficiently abundant to warrant directed fisheries within the constraints of low status exploitation rate limits.

This section provides the preseason agreed to Strait of Juan de Fuca fishery regime for the 2012-13 salmon season. The regime was developed during the preseason planning process through co-manager deliberations and simulation modeling in an effort to achieve harvest and escapement objectives. It will be used as management guidance during the season and may be adjusted by agreement among the parties in response to information that modifies one or more of the preseason assumptions.

4.1.1 Preseason Framework for Commercial Fisheries

Strait of Juan de Fuca Pre-terminal Areas

Areas 5, 6, 6C Treaty Troll (Ntrty net closed)	
NOTE: Area 4B: 5/1-10/31 see Ocean Troll. For 11/1-12/31 & 1/1-4/15 see below.	
5/1-6/16	Closed
6/17 - 9/30	Open for salmon, chum release; Freshwater Bay, south of Angeles Pt./ Observatory Pt. line closed; Pt. Angeles Hbr. W. of line from tip of Ediz Hook to ITT Rayonier Dock closed; Hoko Bay closed, inside the area bounded by a line from Kydaka Point to Shipwreck Point; 1,000 foot closure around stream mouths; Area 6 closed east of line true north from Green Point.
10/1-10/31	Closed
11/1-4/15	In Areas 4B, 5, 6, 6C the treaty troll fishery will be open from November 1, 2012 through April 15, 2013, or when catch reaches the harvest guideline of 8,500 Chinook, whichever comes first. 1,000-foot closures around stream mouths. Hoko Bay closed inside the area bounded by a line from Kydaka Point to Shipwreck Point, for the month of November.
4/16-4/30	Closed
Areas 4B, 5, & 6C Treaty Net (Ntrty net closed)	
Chinook	Open for setnet gear only, 6/17 through 8/11; 7 days a week; Hoko Bay closed, inside the area bounded by a line from Kydaka Point to Shipwreck Point and Freshwater Bay, south of Angeles Pt./ Observatory Pt. line closed. 1,000-ft. closure around stream mouths.
Sockeye	Start to be determined by Fraser River Panel. The Co-managers have identified the following management actions to control by-catch of Chinook. Estimated by-catches are best estimates and are not quotas or ceilings. The priority for this fishery is to harvest the full Treaty share of sockeye salmon, while managing the fishery so as to not greatly exceed the projected incidental harvest of Chinook salmon. All Chinook by-catch in this fishery will be promptly reported by each Tribe to the NWIFC TOCAS database and reported to the U.S. section of the Fraser Panel at least weekly, including take home and ceremonial and subsistence (C&S). If in-season the Chinook by-catch in this fishery exceeds 1,300, the Tribes will consider management actions to limit the Chinook by-catch, such as time or area restrictions, while continuing the priority objective of harvesting sockeye salmon. If in-season the fishery is projected to result in a total Chinook by-catch exceeding 3,300 Chinook, the Tribes will, effective with that scheduled fishery opening, prohibit any commercial sales of Chinook salmon, and any Chinook salmon landed must be delivered to the fishers' respective Tribe.

Coho	Open for gillnets starting at 6 days per week with in-season adjustments based on cumulative catch. Fishery will target coho from the end of Fraser Panel control, through 10/6; 1,000 ft. closure around stream mouths. The gillnet catch number modeled will be used as management guideline and should not be greatly exceeded. Hoko Bay closed, inside the area bounded by a line from Kydaka Point to Shipwreck Point.
Chum	Open for gillnets, starting at 6 days per week (day may be added if effort is low), 10/7 through 11/10; 1,000-foot closure around stream mouths. Hoko Bay closed, inside the area bounded by a line from Kydaka Point to Shipwreck Point.
Area 5 Recreational	
5/1-6/30	Closed
7/1-8/15	2 fish limit, (Chinook 22" min size); release unmarked Chinook, unmarked coho, and chum. South of the Kydaka Pt./Shipwreck Pt. line – closed to salmon angling.
8/16-9/14	2 fish limit; release Chinook, unmarked coho, and chum. South of the Kydaka Pt./Shipwreck Pt. line – closed to salmon angling.
9/15-9/30	2 fish limit; release Chinook and chum. South of the Kydaka Pt./Shipwreck Pt. line – closed to salmon angling.
10/1-10/31	2 fish limit, 1 Chinook (Chinook 22” min size). South of the Kydaka Pt./Shipwreck Pt. line – closed to salmon angling.
11/1-11/30	Closed.
12/1-2/15	Closed
2/16-4/10	1 fish limit (Chinook 22” min size).
4/11-4/30	Closed
Area 6 Recreational	
5/1-6/30	Closed
7/1-8/15	2 fish limit, (Chinook 22" min size); release unmarked coho, Chum and Chinook, except W. of true N/S line through “2” buoy near tip of Ediz Hook retention of marked Chinook allowed. South of Angeles Pt./ Observatory Pt. line – closed to angling. Pt. Angeles Hbr. W. of line from tip of Ediz Hook to ITT Rayonier Dock – closed to salmon angling. Dungeness Bay closed to salmon angling.
8/16-9/30	2 fish limit; release Chinook, unmarked coho, and Chum. South of Angeles Pt./Observatory Point line - closed to angling. Pt. Angeles Hbr. W. of a line from the tip of Ediz Hook to ITT Rayonier Dock – closed to salmon angling. Dungeness Bay closed to salmon angling.

10/1-10/31	2 fish limit, 1 Chinook (Chinook 22" min size). South of Angeles Pt./Observatory Point line – closed to angling. Pt. Angeles Hbr. W. of a line from the tip of Ediz Hook to ITT Rayonier Dock – closed to salmon angling. Sequim Bay south of a line from the south end of Gibson Spit to the west end of Travis Spit - closed to salmon angling. Discovery Bay south of a line from the Gardiner Boat Ramp to Beckett Point - closed to salmon angling. (see: Dungeness Bay Recreational below.)
11/1 - 11/30	Closed
12/1 - 4/10	2 fish limit (Chinook 22" min size). Release unmarked Chinook. Dungeness Bay closed to salmon angling.
4/11 - 4/30	Closed

Strait of Juan de Fuca Terminal Areas

Area 6D Dungeness Bay Net

Chinook	All	Closed
Coho	Trty	Open 9/21 through 10/28 with additional openings possible based on in-season catch composition data; 9/21 through 10/10, seven days per week, fishing 7 am to 7 pm only, nets must be attended by fisher, Chinook and Chum release; 10/11 through 10/28, seven days per week, 24 hours per day; 1,500 ft closure around mouth of Dungeness River.
	Ntrty	Open Wk 38 (wb 9/16) through Wk 42 (wb10/14) for skiff gillnet gear; 7AM – 7PM, 2 days first week starting 9/21 per SCSCI, 4 days T-F wk 39 (wb 9/23); 5 days M-F wks 40-42; Chinook and chum NR, release by cutting ensnaring meshes; 1,500 ft. (1/4 nautical mile) closure around each river mouth. Additional openings possible in wk 43 (wb 10/21) based on in-season information.
Chum	All	Closed
Dungeness River Treaty (Ntrty net closed)		
Chinook	Trty	Closed
Coho	Trty	Commercial fishing up to 3 days/wk, to be determined in-season, for coho only, may occur no earlier than 10/16 and will be restricted to areas below the Dungeness hatchery intake using species selective (non-gillnet) gear. Subsistence fishing using selective gear, may open after 10/15.
Chum	Trty	Closed

Elwha River Treaty (Ntrty net closed)		
Chinook	Trty	Closed except Ceremonial Harvest of 5 fish in July.
Coho	Trty	Closed
Chum	Trty	Closed
Dungeness Bay Recreational		
5/1-9/30	Closed to salmon angling.	
10/1-10/31	2 fish limit, coho only.	
11/1-4/30	Closed to salmon angling.	
Dungeness River Recreational		
(mouth to hatchery intake pipe at RM 11.3)	10/16 - 12/31	4 fish limit, coho only; 12” min size.
Elwha River Recreational		
		Closed to all fishing.
Hoko River Recreational		
(mouth to cement bridge (mile 7.0) on Hoko/Ozette Hwy.)	All year	Closed to salmon.

All other STRAIT OF JUAN DE FUCA REGION freshwater recreational closed to salmon angling.

4.2 Other Recommended Measures

In addition to annual fishery planning, monitoring, stock and harvest assessment, and fishery regulation, the parties recommend that additional tasks be undertaken to facilitate future resource management decisions and actions in order to ensure the health of the resource, as well as attempt to address a number of resource-related problems in this region. Therefore, the following are recommended:

(1) Intensive spawner surveys in summer chum drainages (Discovery Bay, Sequim Bay, Chimacum Creek, and Dungeness River) should be continued in 2012 to determine the number, age, sex ratio, and distribution of spawners. There is insufficient information concerning summer chum salmon in the Dungeness system, therefore surveys of similar intensity and scope should be conducted. Mixed stock fisheries directed at other species during the summer chum time period (including the Fraser sockeye test fisheries) should be monitored and any incidentally caught chum salmon should be DNA sampled to gain information on incidence and origin of summer chum interceptions, stock composition, and run timing and diversion.

(2) Federal, State, and Tribal fisheries agencies, and private organizations developed and implemented a captive brood stock program designed to rehabilitate Chinook salmon runs to the Dungeness River. The primary goal of this recovery program has been to increase the number of fish spawning naturally in the river, while maintaining the genetic characteristics of the existing Dungeness stock. The long term

success of this program will depend on the continuing efforts to monitor and assess stock status, determining and correcting the factors that currently limit production (including habitat degradation), and designing and implementing long term monitoring and evaluation programs to determine the effectiveness of the recovery effort and assist in improving management of the resource.

The 2012 run will include 5 year olds returning from the last juveniles (BY 2007) produced from the captive broodstock program. Returns from this program have been tracked as accurately as possible to evaluate results. These and other efforts should be continued in accordance with the Dungeness River Chinook Rebuilding Plan. Specifically in 2012, releases of smolts should be tagged using CWT's. Their downstream emigration should be monitored using smolt traps. Finally, studies to determine critical freshwater habitat for this species should be implemented.

(3) In the Dungeness River, stream surveys should be used to verify clearance of Chinook salmon from any anticipated fishing areas.

(4) In-stream surveys are recommended to assess the Pysht and Lyre rivers' fall chum runs to document run timing and age composition and to evaluate assumptions concerning the relation of the Pysht River as an escapement index area to other tributaries in the Strait of Juan de Fuca region. Although none have been proposed for 2012, limited and carefully planned test or evaluation fisheries could be considered in order to supplement that assessment.

4.3 Inseason Run Size Updates

During the 2012 season, no inseason updates of run abundance will be provided for Chinook, summer chum, and fall chum salmon returning to the miscellaneous Strait of Juan de Fuca streams. Since no directed fisheries are planned or anticipated for any of these runs and no inseason management action is contemplated, the preseason forecasted returns to the terminal areas will be sufficient.

For coho salmon returning to the Elwha River, no sufficiently accuracy method has been found to provide inseason estimates of abundance. Therefore, inseason harvest management actions will be controlled by time and area closures designed to provide closed periods in the area between the Elwha Hatchery and the river mouth when the major escapement influx is most likely to occur, based on historical information.

For coho salmon returning to the Dungeness River system, an inseason update (ISU) of terminal run abundance can be performed if satisfactory cumulative catch per cumulative effort information from the gillnet fishery in area 6D is available. Methods used to derive the inseason estimate are detailed in Appendix B. If sufficient fishing effort data are not available, the fishery will be managed inseason on the basis of subjective estimates of abundance, escapement progress, and fishing effort. In past years, the fishery has been self-regulating in that low abundance years have had less fishing effort and high abundance years have had increased fishing effort. Due to time and staff constraints the model was not run for 2012.

APPENDICES

A. Preseason Forecasting Methods

B. Inseason Run Assessment Methods

A. Preseason Forecasting Methods[1]

(1) For each forecast, the Tribe or agency that took the lead in assembling the forecast data and generating the forecast is shown in parentheses. Any questions, comments, or corrections regarding a 2012 forecast or methods should be directed to that organization.

A-1. Elwha River Chinook 2011 Return Estimate and 2012 Forecast Estimate (WDFW)

A-1.1 Summary

RY 2011 Returns = 1,863 RY 2012 Forecast = 2,022

A combined total of 1,075 Chinook were sampled in RY 2011 for scales, otoliths, and CWTs from the weir, hatchery, and spawning ground surveys. Otoliths were analyzed for otolith marks in order to distinguish between natural origin and hatchery origin Chinook. Information for wild Chinook ages is not available at this time. We used the proportion of untagged and unmarked samples from the 1,075 carcasses to estimate the wild proportion. Based on otoliths and CWTs, the preliminary hatchery and wild percentages for RY2011 are 92% (1,714) and 8% (149), respectively.

For the AUC method to calculate natural escapement, we had to estimate the number of visible redds during statistical weeks 40 to 43 in 2011 due to the construction work on the lower Elwha dam. Viewing conditions during surveys were poor for that time period. We used visible redd information for RY's 2002, 2009, and 2010 to extrapolate redd counts. These three years were chosen due to the viewing conditions during the entire spawning season.

A-1.2 Elwha Chinook 2011 Return

The following is a summary for the estimated number of adult Chinook returns to the Elwha River in RY2011 (jacks not included in totals):

1) Estimated number of Chinook spawned naturally in the Elwha River (AUC-redd based) plus redd counts by LEK= 843 adults
2) Number of Chinook released upstream of dam=10 (7 males + 3 females)
3) Number of Chinook gaffed and spawned upstream of weir = 249 (87 males + 134 females + 28 NVF *)
4) Number of Chinook gaffed and spawned downstream of weir = 581 (201 males + 274 females + 106 NVF* + 2 jacks)
5) Number of Chinook spawned at weir = 23 (17 males + 6 females)
6) Number of Elwha River weir Chinook spawned at WDFW Elwha Channel + NVF* = 18 (13 males + 4 females + 1 NVF*)
7) Number of Chinook volunteered trapped at WDFW Elwha Channel + LEK Hatchery transfer and spawned, including NVF = 69 (58 males plus 10 females+ 1NVF* + 2 jacks)
8) No Chinook killed and surplused to river = 29 (29 males + 0 females + 2 jacks
9) Number of trap mortalities = 41 (40 males + 1 female + 4 jacks)
10) 2011 Terminal run size = 1,863 **(**excluding jacks**)**

*NVF = non- viable females

Table A-1-a. Elwha River Chinook Salmon Terminal Runsize from 1986 to 2011

Return Year	Extreme Terminal Run(1)	Natural Spawning Escapement	Hatchery Brood stock(2)	Pre-spawning Mortality(3)	Terminal Harvest
1986	3,159	855	1,414	858	32
1987	6,220	1,642	1,989	2,262	327
1988	8,667	5,228	2,167	478	794
1989	5,704	3,035	1,892	560	217
1990	3,606	1,644	1,312	224	426
1991	3,761	1,642	1,719	108	292
1992	4,002	479	743	2,637	143
1993	1,669	633	929	7	100
1994	1,580	163	1,053	330	34
1995	1,814	524	626	662	2
1996	1,877	364	1,244	267	2
1997	2,534	1,585	939	10	7
1998	2,411	720	1,638	51	2
1999	1,642	903	699	23	17
2000	1,913	715	1,136	62	0
2001	2,246	655	1,553	38	0
2002	2,416	863	1,513	40	0
2003	2,305	1,045	1,182	78	0
2004	3,439	2,075	1,325	39	0
2005	2,242	835	1,396	7	4
2006	1,931	693	1,227	7	4
2007	1,153	380	760	9	4
2008	1,157	470	667	16	4
2009 (4)	2,192	651	1,514	16	
2010	1,278	564	709	5	0
2011 (5)	1,863	853	1,010	0	0

(1) Extreme terminal run = natural spawning escapement + hatchery broodstock + pre-spawning mortality + terminal harvest
(2) Hatchery broodstock = (hatchery voluntary escapement plus gaff-seine removals minus in- hatchery pre-spawning mortality). See Table A-1-b for individual numbers.
(3) Pre-spawning mortality = (In-hatchery pre-spawning mortality plus In-river pre-spawning mortality)
(4) Includes 11 fish released upstream
(5) Hatchery broodstock includes non-viable females, trap mortalities, surplus males

Table A-1-b. Elwha River Chinook Natural and WDFW Rearing Channel Pre-spawning Mortalities from 1986 to 2011

Return Year	Hatchery Voluntary Escapement(1)	Natural Spawners(2)	In-River Gross Escapement(3)	Gaff-Seine Removals (4)	In-Hatchery Pre-spawning Mortality(5)	In-River Pre-spawning Mortality(6)
1986	1,285	855	1,842	505	376	482
1987	1,283	1,642	4,610	1,138	432	1,830
1988	2,089	5,228	5,784	506	428	50
1989	1,135	3,035	4,352	905	148	412
1990	586	1,644	2,594	886	160	64
1991	970	1,642	2,499	857	108	n/a
1992	97	479	3,762	672	26	2,611
1993	165	633	1,404	771	7	0
1994	365	163	1,181	749	61	269
1995	145	524	1,667	518	37	625
1996	214	364	1,661	1,177	147	120
1997	318	1,585	2,216	624	3	7
1998	987	720	1,422	702	51	0
1999	182	903	1,420	517	23	0
2000	404	715	1,447	732	62	0
2001	595	655	1,613	958	38	0
2002	561	863	1,815	952	40	0
2003	692	1,045	1,535	490	78	0
2004	476	2,075	2,924	849	39	0
2005	204	835	2,027	1,192	7	0
2006	366	693	1,554	861	7	0
2007	186	380	954	574	9	0
2008	89	470	1,048	578	16	0
2009	207	651	1,958	1,307	16	0
2010	65	564	1,108	644	5	0
2011	116	853	1,706	853	41	0

(1) Hatchery Voluntary Escapement = Those adult Chinook that returned to the WDFW Elwha Rearing Channel and were spawned for broodstock. 2011 includes surplus males and fish transferred from weir and LEK hatchery.
(2) Natural Spawners= Estimate of natural adult Chinook spawning in the Elwha River based on redd surveys by WDFW and LEK
(3) In-River Gross Escapement= The sum of natural spawners, gaff-seine removals, and in-river pre-spawning mortalities
(4) Gaff-Seine Removals= Those adult Chinook collected for broodstock by WDFW hatchery staff and volunteers either by gaffing or seining methods from the Elwha River. 2011 includes 23 Chinook spawned at weir site.
(5) In-Hatchery Pre-spawning Mortalities= The sum of adult Chinook that died at the hatchery and could not be used for broodstock
(6) In-River Pre-spawning Mortalities=The sum of adult Chinook that died in the Elwha River prior to spawning

Table A-1-c. Strait of Juan de Fuca; Elwha - Dungeness Chinook Salmon TRS

Year	Elwha River	Proportion Elwha	Dungeness River	Proportion Dungeness	Strait ETRS
1986	3,159	0.926	254	0.074	3,413
1987	6,220	0.979	133	0.021	6,353
1988	8,667	0.959	372	0.041	9,039
1989	5,704	0.984	95	0.016	5,799
1990	3,606	0.909	361	0.091	3,967
1991	3,761	0.95	199	0.05	3,960
1992	4,002	0.963	154	0.037	4,156
1993	1,669	0.969	54	0.031	1,723
1994	1,580	0.96	65	0.04	1,645
1995	1,814	0.918	163	0.082	1,977
1996	1,877	0.911	183	0.089	2,060
1997	2,544	0.98	52	0.02	2,596
1998	2,462	0.957	110	0.043	2,572
1999	1,642	0.956	75	0.044	1,717
2000	1,913	0.898	218	0.102	2,131
2001	2,246	0.832	453	0.168	2,699
2002	2,416	0.792	633	0.208	3,049
2003	2,305	0.783	640	0.217	2,945
2004	3,439	0.772	1,014	0.228	4,453
2005	2,242	0.675	1,081	0.325	3,323
2006	1,931	0.556	1,543	0.444	3,474
2007	1,153	0.741	403	0.259	1,556
2008	1,157	0.835	229	0.165	1,386
2009	2,192	0.908	220	0.092	2,412
2010	1,931	0.556	1,543	0.444	3,474
2011	1,863	0.737	665	0.263	2,528
Average 2008 to 2011	**1,786**	**0.729**	**664**	**0.271**	**2,450**

A-1.3 Elwha Chinook 2012 Forecast

Tables Table A-1-d and Table A-1-e show the numbers and proportions of adult Chinook returns by age for the return years 2008 to 2011, respectively. A total of 2,022 adults would return in 2012 using the past method of calculating the four year average adult return. The numbers in the tables do not take into consideration NORs since they cannot be determined accurately.

Table A-1-d. Number of Elwha Chinook Adults by Age for the Return Years 2008 to 2011

Return Year	Age 3	Age 4	Age 5	Age 6	Total
2008	795	283	75	0	1,153
2009	117	2,052	23	0	2,192
2010	529	139	611	0	1,279
2011	897	936	30	0	1,863

Table A-1-e. The Proportion of Elwha Chinook by Age for the Return Years 2008 to 2011

Return Year	Age 3	Age 4	Age 5	Age 6	Total
2008	0.690	0.245	0.065	0.00	1.00
2009	0.053	0.936	0.011	0.00	1.00
2010	0.414	0.108	0.478	0.00	1.00
2011	0.481	0.503	0.016	0.00	1.00

Table A-1-f shows the number of Chinook fingerlings and yearlings released into the Elwha River for the brood years 2006 to 2009. A four year average of the return rates was calculated for each age category for the fingerling and yearling releases. The number of estimated adult returns in 2012 was calculated by multiplying the number of fingerlings released by the average return rate for fingerlings and multiplying the number of yearlings released by the average return rate for yearlings. This approach would estimate a total return of 1,241 hatchery adults.

Table A-1-f. Number of Chinook Fingerlings and Yearlings Released into the Elwha River

Age at Return 2012	Brood Year	Fingerling Releases	Yearling Releases	Return Rates Fingerlings	Adult Returns	Return Rates Yearlings	Adult Returns	Total
Age 6	2006	2,614,000	276,950	0.000000	0	0.000000	0	2
Age 5	2007	1,868,000	340,946	0.000060	113	0.000030	10	123
Age 4	2008	939,000	201,017	0.000331	311	0.000067	113	324
Age 3	2009	3,047,730	200,824	0.000254	775	0.000084	17	792
Total					**1,199**		**40**	**1,241**

Adjustment factors and adjusted return rates were calculated for fingerlings and yearlings based on year class strength in tables Table A-1-g and Table A-1-h, respectively. Adjustment Factor uses a 4 year mean (not including previous year) and adjusts by the brood's previous year return rate over the mean. Table A-1-i summarizes the total hatchery Chinook adult returns from the fingerling plus yearling releases. Including the adjustment factor estimates a total return of 1,911 hatchery adults.

Table A-1-g. Fingerling Sibling Adjustment Factor and Adjusted Return Rates

Total Age	Return Rates Fingerlings	Adjustment Factor	Adjusted Return Rate	Adult Returns
Age 6	0.00000063	0.0937239	0.00000000	0
Age 5	0.00006531	1.8135843	0.00010921	204
Age 4	0.00026950	2.4983022	0.00082639	776
Age 3	0.00016971	n.a.	0.00025443	775
Total				**1,755**

A strong showing of 3 year olds in 2011 return (fingerling releases = 792) suggest stronger 4 year olds than is forecast using above method (776). A strong pattern in brood returns is more 4 year olds than 3 year olds, so we think this forecast is conservative on 4 year old returns.

Table A-1-h. Yearling Sibling Adjustment Factor and Adjusted Return Rates

Total Age	Return Rates Yearlings	Adjustment Factor	Adjusted Return Rate	Adult returns
Age 6	0.00000000	2.88609111	0.00000000	0
Age 5	0.00001752	0.77619130	0.00002340	8
Age 4	0.00009069	9.75293420	0.00064994	131
Age 3	0.00003158	n.a.	0.00008421	17
Total				**156**

Table A-1-i. Estimated Total Hatchery Chinook Adult Returns in 2012 from the Fingerling Plus Yearling Releases.

Age at Return 2011	Brood Year	Fingerling Releases	Yearling Releases	Total Age	Adult Return from Fingerlings	Adult Return from Yearlings	Est. Total Adult Returns
Age 6	2006	2,614,000	276,950	Age 6	0	0	0
Age 5	2007	1,868,000	340,946	Age 5	204	8	212
Age 4	2008	939,000	201,017	Age 4	776	131	907
Age 3	2009	3,047,730	200,824	Age 3	775	17	792
Total					**1,755**	**156**	**1,911**

An estimated 111 wild Chinook would be in addition to the forecasted estimate of 1,911 hatchery returns. This brings the total return estimate to 2,022. The hatchery-wild proportion is based on a three year average of otoliths and CWTs recovered in carcasses sampled (0.945 hatchery and 0.055 wild).

Three and four year old Chinook are expected to return to Morse Creek in 2012. A reasonable expectation would be that they return at a similar rate to the Elwha yearling releases since they are of the same stock and released at the same rate as the Elwha yearlings (200,000 target).

A-2 Dungeness River 2011 Chinook Return Estimate and 2012 Forecast (WDFW)

A-2.1 Summary

RY 2011 Forecast = 885 RY 2012 Forecast = 718
RY 2011 Returns = 665

The following is a summary for the estimated number of adult Chinook returns to the Dungeness River and Greywolf River in 2011:

1) Estimated number of Chinook spawned naturally in the Dungeness basin (redd based) =535 (207 redds in Dungeness + 7 redds in Greywolf = (214 total redds x 2.5 fish/redd)
2) Number of Chinook collected and spawned for broodstock =114 (46 females +68 males + no jacks)
3) Number of brood stock pre-spawn mortalities = 9 adults (4 males + 5 females)
4) Number of mortalities = **7** (5 males + 2 females)
5) Terminal run size (excluding 2 year old jacks) = 535+114+9+7= 665

Preliminary Ages- based on CWT returns and scale ages

Table A-2-a. Number and Age of Wild and Hatchery Returns with Percent by Age Group

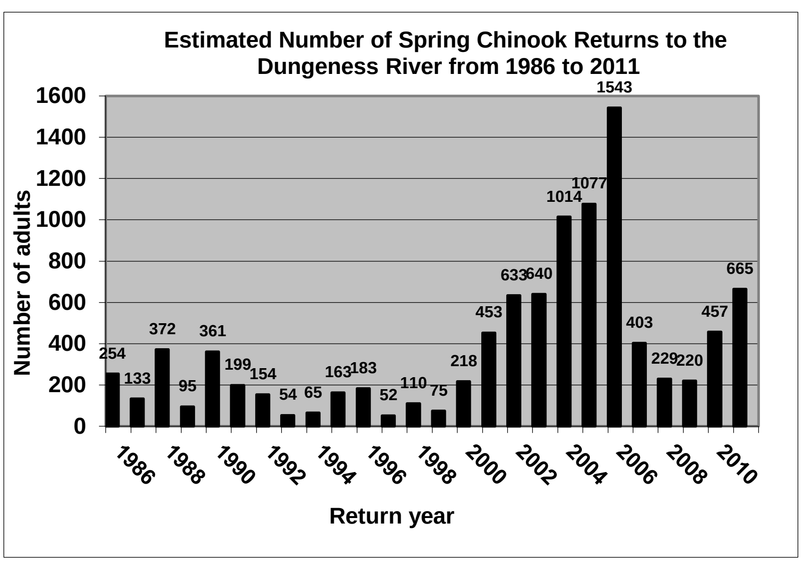
Return Year	Wild Returns	Percent of Wild Returns	Hatchery Returns	Percent of Hatchery Returns	Total Returns	Percent of Total Returns
Age 3	37	36%	278	50%	315	47%
Age 4	44	42%	260	47%	304	46%
Age 5	23	22%	23	4%	46	7%
Total	**104**	**100%**	**561**	**100%**	**665**	**100%**

A total of 214 Chinook were sampled for CWTs and scales. Samples included fish caught for brood stock and during spawning ground surveys. Please note that I cannot assign origins or ages for 4 carcasses in 2008, 6 carcasses in 2009, and 3 carcasses in 2010. These fish were classified as unknowns and are not included in the tables for hatchery and wild ages.

Table A-2-b. Dungeness River Chinook Salmon Terminal Run Size from 1986 to 2011

Return Year	Natural Escape.	Broodstock Collected	Prespawn. Mort./surplus	Area 6D Harvest	FW Recr. Harvest	Terminal Run
1986	238			9	7	254
1987	100			4	29	133
1988	335			5	32	372
1989	88			1	6	95
1990	310			0	51	361
1991	163			19	17	199
1992	153			1	0	154
1993	43			1	10	54
1994	65			0	0	65
1995	163			0	0	163
1996	183			0	0	183
1997	50			0	2	52
1998	110			0	0	110
1999	75			0	0	75
2000	218			0	0	218
2001	453			0	0	453
2002	633			0	0	633
2003	640			0	0	640
2004	953	52	9	0	0	1,014
2005	955	113	9	2	2	1,081
2006	1,405	106	32	0	0	1,543
2007	305	88	10	0	0	403
2008	140	87	2	0	0	229
2009	128	71	21	0	0	220
2010	345	90	22	0	0	457
2011	535	114	16	0	0	665

Figure A-2-a. Total Number of Chinook Adult Returns in the Dungeness River for the Adult Return Years 1986 to 2011, Including In-river Spawners, Pre-spawn Mortalities, Broodstock, and Harvest



A-2.2 Dungeness Chinook 2012 Forecast

The Dungeness Chinook forecast estimate for Return Year 2012 is **623** hatchery plus **95** wild =**718**.

A-2.2.1 Hatchery Dungeness Chinook Forecast

Table A-2-c and Table A-2-d show the numbers and proportions of adult hatchery Chinook returns by age for the return years 2008 to 2011, respectively.

Table A-2-c. Number of Dungeness Hatchery Chinook Adults by Age for the Return Years 2008 to 2011

Return Year	Age 3	Age 4	Age 5	Age 6	Total
2008	38	45	2	2	87
2009	44	55	2	0	101
2010	206	147	7	0	360
2011	278	260	23	0	561

Table A-2-d. The Proportion of Hatchery Dungeness Chinook by Age for the Return Years 2008 to 2011

Return Year	Age 3	Age 4	Age 5	Age 6	Total
2008	0.437	0.517	0.023	0.023	1.000
2009	0.433	0.546	0.021	0.000	1.000
2010	0.572	0.408	0.019	0.000	1.000
2011	0.495	0.464	0.040	0.000	1.000

Table A-2-e. Numbers of Accelerated Zeros and Yearlings Released in the Dungeness Watershed for Brood Years 2005-2009

Brood Year (n)	Accelerated 0's Release Year n+1	Yearlings Release Year n+2
2005	112,800	117,864
2006	102,540	127,200
2007	98,900	25,750
2008	99,350	99,219
2009	100,600	43,242

Table A-2-f. Fingerling Sibling Adjustment Factor and Adjusted Return Rates

Total Age	Return Rates Fingerlings	Adjustment Factor	Adjusted Return Rate	Adult Returns
Age 6	0.00000000	0.57517329	0.00000000	0
Age 5	0.00022042	1.27886278	0.00025195	25
Age 4	0.00120178	2.89387984	0.00367176	365
Age 3	0.00069911	n.a.	0.00091979	93
Total				**483**

Table A-2-g. Yearling Sibling Adjustment Factor and Adjusted Return Rates

Total Age	Return Rates Yearlings	Adjustment Factor	Adjusted Return Rate	Adult returns
Age 6	0.00010729	0.29522939	0.00003168	4
Age 5	0.00026629	2.70235735	0.00063508	16
Age 4	0.00066106	1.15925958	0.00095270	95
Age 3	0.00055642	n.a.	0.00057119	25
Total				**140**

The forecast for total hatchery Chinook returns in 2012 is **623.**

A-2.2.2 Wild Dungeness Chinook Forecast

Table A-2-h shows the number of wild Chinook smolts by outmigration year in the Dungeness River for the brood years 2005 to 2009 and the number of wild adult returns. A four year average of the return rates was calculated for each age category for the natural smolt production. The number of estimated adult returns in 2012 was calculated by multiplying the number of natural smolts produced by the average return rate. The adjustment factor for the wild adult returns in 2012 was calculated by multiplying the number of natural smolts produced by the average return rate and then by adjusting the age 4s by previous year's performance (Table A-2-i).

Table A-2-h. Number of Wild Chinook Smolts by Outmigration Year in the Dungeness River for the Brood Years 2005 to 2009.

Brood Year	Smolt Year	Natural Smolt Production	Age 3	Age 4	Age 5	Age 6	Totals
2005	2006	124,928	38	93	12	0	143
2006	2007	136,571	4	57	23		84
2007	2008	14,239	25	44			69
2008	2009	20,354	37				37
2009	2010	9,764					
2010	2011	10,222					

Table A-2-i. Adult Return Rates for Wild Chinook Smolts in the Dungeness River by Age for the Brood Years 2005 to 2009.

Brood Year	Smolt Year	Natural Smolt Production	Age 3	Age 4	Age 5	Totals
2005	2006	124,928	0.00030418	0.00074443	0.00009606	0.00000000
2006	2007	136,571	0.00002929	0.00041737	0.00016841	
2007	2008	14,239	0.00175574	0.00309010		
2008	2009	20,354	0.00181782			
2009	2010	9,764				
		Mean Return Rates	0.00097676	0.00141730	0.00013223	
		Unadjusted 2012 Wild Forecast	10	29	2	41
		Adjusted 2012 Wild Forecast	1/	75	10	95

1/ Adjust 4s and 5s by previous year's performance.

Adjusted 2012 Dungeness Wild Chinook forecast = **95**

A-3. Hoko River Chinook 2012 Forecast (Makah Tribe)

A-3.1 Summary

The 2012 forecast abundance for Hoko River Chinook is 2,791 mature ocean recruits, or 9,107 total ocean recruits. The estimate of total ocean recruits is in units suitable for input as the initial cohort size in FRAM, which will discount the immature fish. In terms of "escapement in the absence of fishing" this forecast would produce 1,927 spawners entering the river.

These recruits were forecasted by age class, using two methods. For ages 3, 4 and 5, these recruits were forecasted from linear regression models based on estimated sibling abundance in 2011. The regression models to forecast these age classes are based on statistically significant linear relationships ($P<0.01$) between $\text{recruits}_{\text{age-1, RY-1}}$ and $\text{recruits}_{\text{age, RY}}$.

Two age groups, however, were not predicted from sibling regression models. The regression models were not significant to predict recruits of age 6; instead those were predicted as the mean of the previous five years of recruits of age 6. Likewise, since we have no data on the abundance of 1-year old Hoko Chinook at sea, we predicted the 2-year olds as the five-year mean of 2-year- old recruit abundance. Historically, ages 3 through 5 have comprised 94 percent of the recruits to this stock, so errors associated with using the mean for ages 2 and 6 are not likely to make a great difference in this abundance forecast.

The age-breakout for this forecast is shown in Table A-3-a.

Table A-3-a. Hoko River Chinook Forecast by Age (1)

Age	Total Recruits	Maturation Rates	Escapement without Fishing
2	3,572	0.0033	51
3	1,189	0.0979	105
4	1,921	0.3802	588
5	2,347	1	1,124
6	78	1	59
7	0	1	0
Totals	**9,107**		**1,927**

(1) With the exception of the 4-year-olds, the total recruits were not calculated by forecasting the mature recruits and then dividing by the maturation rate; therefore, the reader should not attempt to reproduce one unit of fish (either mature or total) from the other unit of fish. The results might be close, but they will likely not be identical.

A-3.2 Forecasting Methods

A-3.2.1 Overview

This forecast was developed from sibling linear regressions based on a reconstruction of the estimated 2011 recruits. In order to develop these regression relationships, and the data sets that they use, we conducted a coded-wire-tag based cohort reconstruction of Hoko River Chinook for brood years 1985 through 2005 and return years 1987 through 2010. Among the estimates produced by this cohort reconstruction are age-specific abundances and exploitation rates.

A-3.2.2 Reconstructing the 2011 Run

To forecast 2012 recruits, we needed estimates of 2011 abundances. CWT recovery data for 2011 are not yet complete, however. In order to estimate the 2011 recruits, therefore, we relied on the simple relationship that in any given return year, *RY*, the escapement to the spawning grounds is equal to the ocean recruits *R* times (1-exploitation rate) as shown in Equation (1).

(1) $$Esc_{RY} = R_{RY}\ (1 - ER_{RY})$$

Where:

Esc = Escapement

R = Recruits

ER = Exploitation rate

RY = Return year

This equation can be rearranged to estimate recruitment from escapement and *ER*, as:

(2) $$R_{RY} = Esc_{RY}\ / 1 - ER_{RY}$$

This same equation can be used to estimate the 2011 abundance of recruits of ages 2 through 6. To estimate age composition of the spawning population, we used scales from spawners sampled in the river and at the

Hoko Falls Hatchery. The abundance in the spawning population was then expanded, using Equation (2) above, to estimate age composition of ocean recruits in 2011 (2).

(2) Equation 2 was not applied to 2-year-olds, however. Since they are mostly too small to be taken in gillnets, and they are sublegal in troll and sport fisheries, the exploitation rate for 2-year-olds was assumed to be zero. For all other age groups, the exploitation rate was simplistically assumed to be equal across ages. Further analysis might allow use of age-specific exploitation rates in reconstructing the most recent return year abundance.

For Chinook returns from past years, we used CWT recovery data to estimate the exploitation rate. For the 2011 return year, however, in the absence of recent-year CWT data, we estimated the exploitation rate used in this forecast as an "adjusted mean" exploitation rate for the five most recent years of complete CWT recovery data (2006 through 2010). The 5-year mean *ER* was adjusted to reflect the differences between the 2011 Chinook catch and the 2006-2010 mean Chinook catches in the fisheries that account for the largest impacts on Hoko Chinook. Historically, Alaskan and Canadian fisheries have accounted for over 80 percent of the harvest of Hoko Chinook. No adjustments were made to the mean exploitation rates in Washington and Oregon fisheries, which exert relatively small impacts on Hoko Chinook.

Using the preliminary estimate of 1,504 hatchery-origin Chinook spawners in 2011 and an estimated 2011 total ER of 0.2933 (Table A-3-b) we derived an estimate of 2,127 mature recruits of hatchery origin (in terms of escapement plus fishery mortality) in 2011 (Table A-3-c), Column labeled "Esc+FM"). These 2,127 recruits were further expanded to account for natural mortality (using FRAM mortality rates) to give an estimate of 2,891 ocean recruits at the beginning of the FRAM model-year (Table A-3-c), Column labeled "Recruits". When the FRAM maturity schedule is used to add in immature fish, the 2,891 mature ocean recruits become the equivalent of 8,458 total ocean recruits (mature + immature). This number might appear to be a startlingly large population, but most of them were immature; they did not contribute to either catch or escapement, and most will not likely survive to be mature recruits in the future.

These recruits were broken out into age classes based on scales sampled from in-river spawners and hatchery broodstock in the Hoko in 2011 and read by the WDFW scale lab. During the 2011 spawning season, approximately 71 percent of the 321 Chinook sampled at the hatchery and 8 percent of the 1,275 in-river spawners were sampled for scales.

Table A-3-b.

Exploitation Rates on Hoko Chinook					
RY	Total ER	Alaska	Canada	WA	OR
2006	0.2144	0.1188	0.0885	0.0071	0.0000
2007	0.4474	0.2191	0.2147	0.0136	0.0000
2008	0.2372	0.0904	0.1468	0.0000	0.0000
2009	0.1478	0.0620	0.0794	0.0062	0.0000
2010	0.0947	0.0257	0.0666	0.0024	0.0000
5-yr mean	0.2283	0.1032	0.1192	0.0059	0.0000
2011 ER Scalars(1)		1.0934	1.4647		
2011 ER Est.	0.2933	0.1128	0.1746	0.0059	0.0000

(1) 2011 ER scalars for SEAK and WCVI are based on the ratio of 2011 Chinook catch to the 2006-2010 mean catch for those regions. See files: D:\Salmon\Canada\CanadaChinookCatch.xls & D:\Salmon\Chinook\SEAKChinookCatch.xls

Table A-3-c.

2011 Return Year Reconstruction					
	Mature			Expand for Immatures	
Age	Esc	Esc+FM(1)	Recruits(2)	Multiplier(3)	Incl. Imm.
2	4	4	5	215.28	1,171
3	106	150	204	8.64	1,763
4	1,326	1,876	2,551	2.11	5,394
5	68	96	131	1.00	131
6	0	0	0	1.00	0
7	0	0	0		
Total	**1,504**	**2,127**	**2,891**		

(1) 2011 escapement + fishery-mortality are estimated from escapement as Esc/(1-ER) where ER for 2011 is estimated as described in Footnote 4, below. Escapement estimates are from stream surveys + hatchery broodstock.

(2) Estimates of ocean recruits include fishery mortality, spawning esacapement and natural mortality that is subtracted out by FRAM.

(3) Multiplier to include immatures is not exactly the same number as in the FRAM maturity schedules. The used multiplier here accounts for the immature fish that are already included in the "Esc + FM" estimate.

A-3.2.3 Predicting the 2012 Abundance

Ocean recruits in 2012 were predicted by age group (for ages 3 through 5) using sibling linear regression models based on the CWT- reconstructed recruit estimates described above. These years were used for the database because 1989 was the first year that tagged 4-year-olds returned to the Hoko, and 2010 was the most recent year for which CWT recovery data appear to be (mostly) complete. In these sibling regression models, 3-year-olds in 2012 are forecasted from 2-year-olds in 2011, and so on for each age group. Details on the age-specific forecasts are shown in Tables A-3-d and A-3-e.

Table A-3-d.

Predicted 2012 Ocean Run Size FRAM-Ready, Including Immatures							
	Supplementals		Nat-Origin(1)	Supp+Nat	Supp+Nat Adjusted(2)		Prop.
Method	Mat+FM	All	All	All	All	Marked	Marked
5-yr mean	41	2,175	1,397	3,572	3,572	1,794	0.50
Regression	84	724	465	1,189	1,189	637	0.54
Regression	445	1,008	648	1,656	1,921	1,160	0.60
Regression	1,082	1,429	918	2,347	2,347	1,429	0.61
5-yr mean	47	47	30	78	78	45	0.57
Totals	**1,700**	**5,384**	**3,458**	**8,842**	**9,107**	**5,065**	**0.56**

(1) Multiplier to estimate natural-origin from supplemental-origin Hoko Chinook: 0.6423. This multiplier is the mean of that ratio for the 10 most recent reconstructed return years (2000-2009).

(2) "Adjusted" forecast of total recruits includes change in 4-year-olds, scaling them from predicted mature recruits, rather than from regression model using 2011 total ocean 3-year-olds.

Table A-3-e.

Predicted 2012, Mature Only			
FRAM Maturation Rates	Mature Recruits Scaled	Mature Recruits Modeled	Escapement without Fishing
0.0033	12	68	51
0.0979	116	139	105
0.3802	730	730	588
1.0000	2,347	1,777	1,124
1.0000	78	78	59
1.0000	0	0	
Total	**3,283**	**2,792**	**1,927**

All age classes from 2 through 6 were forecasted in two "units of fish". The first is in terms of fishery mortality + escapement + natural mortality, and can be considered the run size that fishery managers have to work with in 2012. The second forecast includes immature fish (*i.e.*, fish that will not likely be caught in 2012, but will also not return to the terminal area to spawn). These were also forecasted using sibling regression models, but in these forecasts the independent variable was the 2011 recruits, also estimated in terms that include immatures, using the FRAM age-specific maturity schedule for "Stock 35" (Strait of Juan de Fuca). Because only a small fraction of 2- and 3-year-olds are mature under the FRAM schedule, this second forecast includes large numbers of 2- and 3-year-olds, and smaller numbers of 4-year-olds, that will not contribute to the 2012 spawning escapement, or to catch or calculations of exploitation rates.

To summarize the results of the regression analyses, the linear relationship between recruits of age *i* in year *y*, and their siblings of age *i+1* in year *y+1* was statistically significant (P<0.05) for models predicting ages 3 through 5, and was highly significant (P<0.01) for predicting age 4. The one exception to these results was the model predicting age-4 *total* recruits from age-3 *total* recruits, which was not significant; however, the model predicting age-4 *mature* recruits from age-3 *mature* recruits was significant (P=0.0115). Because the model predicting total age-4 recruits was not significant, the forecast of *total* age-4 recruits in this forecast was calculated as the estimate of *mature* age-4 recruits divided by the maturation rate for age 4.

The only age classes that were not forecasted using sibling regression method were ages 2 and 6. Because there is no abundance estimate of age-1 siblings from 2011 (or from any year) the forecast of age-2 was taken as the mean of the estimated age-2 recruits for the years 2006 through 2010. There is considerably more error in predicting age-2 recruits than in predicting the other age classes, but since most 2-year-olds (over 99 percent) are considered immature in FRAM, this error should not make a great difference in modeling exploitation rates or spawning escapement. Six-year olds were also forecasted as the most recent 5-year mean of 6-year-old recruits. Unlike the 2-year-olds, the 6-year-olds do contribute to catch and escapement; however, their numbers are small – less than 4 percent of the forecasted run – so errors in this method of predicting should not have a great impact on fishery management decisions.

These forecasts include both hatchery-origin and natural-origin recruits. Since the Makah Tribe operates the Hoko Hatchery to supplement and sustain the natural stock (as opposed to developing a separate hatchery run for harvest) the two groups are combined as an integrated stock, and final forecast does not distinguish between hatchery- and natural-origin recruits.

A-4. Natural Summer Chum Salmon (PNPTC)

The 2012 forecast of the Strait of Juan de Fuca summer chum salmon returns was forecast as total recruitment to all fisheries and escapements for the Sequim, Discovery, and Port Townsend Management Units (MUs).

Abundance for each MU was forecast as the mean of the 2008 through 2011 returns.

Supplementation and reintroduction projects were implemented in Salmon Creek (Discovery MU) from 1992 through 2003, in Chimacum Creek (Port Townsend MU) from 1996 through 2003, and in Jimmycomelately Creek (Sequim MU) from 1999 through the present. Summer chum fry from each project were marked and natural-origin recruits (NORs) can be distinguished from supplementation-origin recruits (SORs) upon return as adults. Fry released from each project have contributed substantially to the summer chum adult recruitment and escapements.

For two management units (Discovery and Chimacum), the returns of summer chum were forecast based on natural-origin fish because after the termination of supplementation projects, no supplementation-origin adults are expected to return to these MUs in 2012.

Estimates of the number of natural-origin recruits and supplementation-origin recruits returning to each MU each year from 1999 through 2011 and forecasts for 2012 are shown in Table A-4-a.

The 2012 forecasted returns are 2,540 summer chum to the Sequim MU, 2,282 summer chum to the Discovery MU, and 1,093 summer chum to the Port Townsend MU. The total forecasted return is 5,915 summer chum to Strait of Juan de Fuca in 2012 (Table A-4-a).

The Summer Chum Salmon Conservation Initiative (SCSCI) defines Critical and Recovery abundance and escapement thresholds for the Sequim and Discovery Bay Management Units (Table A-4-b).

The 2012 forecasted abundance for the returns of summer chum exceed the Critical threshold for each Management Unit and exceed the Recovery threshold for the Sequim and Discovery MUs. The Co-Managers will conduct annual post-season abundance assessments comparing the forecasts to actual returns for each MU, as required by the Summer Chum Salmon Conservation Initiative (SCSCI).

Table A-4-a. Strait of Juan de Fuca Summer Chum Salmon Natural and Supplementation Origin Recruits, 1999-2011 and 2012 Forecast

Year	Sequim Bay MU		Discovery Bay MU		Port Townsend MU	
	NOR	SOR	NOR	SOR	NOR	SOR
1999	7	0	141	391	0	38
2000	55	0	460	419	0	52
2001	253	9	1,230	1,581	0	909
2002	2	40	4,100	1,972	129	738
2003	69	381	4,021	1,983	229	334
2004	614	1,051	4,402	2,028	593	548
2005	496	821	4,656	2,356	894	510

2006	346	382	4,911	605	1,480	554
2007	659		1,684	42	903	30
2008	1,066		1,760	0	735	0
2009	2,655		1,481	0	1,030	0
2010	4,027		3,264		1,968	
2011	2,411		2,621		640	
2012 Forecast a/	**2,540**		**2,282**		**1,093**	
2012 Total Strait of Juan de Fuca Forecast					**5,915**	

(1) 2008-2011 mean

Table A-4-b. Strait of Juan de Fuca Summer Chum Salmon Critical and Recovery Thresholds

Strait of Juan de Fuca Management Unit	Critical Threshold		Recovery Threshold	
	Abundance	Escapement	Abundance	Escapement
Sequim Bay MU	220	200	520	330
Discovery Bay MU	790	720	1,560	970
Port Townsend MU	- - -	- - -	- - -	- - -

A-5. Western Strait of Juan de Fuca Natural Coho Salmon (Makah Tribe)

A-5.1 Summary

This forecast predicts 15,558 January age-3 ocean recruits to be used as an input to FRAM. This is the equivalent of 12,269 ocean age-3 recruits, used for input to reports by the Salmon Technical Team.

This forecast is based on the estimated brood year 2009 outmigration of 305,022 smolts multiplied by a marine survival rate of 5.1%. That survival rate is the weighted mean of four predictions of marine survival from four regression models. Those models use as their predictors:

- log-transformed jack return rate to the Lower Elwha Hatchery
- coho CPUE from the NOAA September trawl survey
- copepod species-richness anomaly, generated by NOAA

The fourth model used here is a multiple regression model with the independent variables ln(jack return rate) and copepod species richness.

A-5.2 Introduction

This forecast for Strait of Juan de Fuca wild coho is based on the simple observation that in the life-cycle of the coho the number of adult recruits is the number of outmigrating smolts multiplied by the marine survival rate.

*Recruits = Smolts * Marine Survival*

In this case, because the abundance forecast is intended to be used in the FRAM model, which begins at January of age 3 for the coho, the marine survival rate predicted here covers the period from downstream migration and entry into marine waters up to January of age-3.

The forecast process employed here involved estimating smolt abundance and predicting marine survival.

A-5.3 Data Sources

This forecast uses estimates of recruit abundance, smolt production, and marine survival, the sources of which are described below.

A-5.3.1 Natural-Origin Cohort Abundance

Estimates of natural-origin recruits were derived from natural escapement estimates, based on the assumption that the natural-origin recruits underwent a pre-terminal exploitation rate similar to that experienced by unmarked recruits produced at the Elwha hatchery. Using that assumption, we can back-calculate from escapement estimates to obtain the estimate as follows:

(1)

$$R_{natural} = \frac{Escapement_{natural}}{1 - ER_{preterm,\ unmarked}}$$

Where:
R = Recruits
ER = Exploitation rate

Pre-terminal exploitation rate is used here, rather than total exploitation rate, to eliminate the effect of any terminal catch in the Elwha River, which does not apply to the coho in the independent streams in the Strait. In recent years, there has been no terminal coho fishery in Strait of Juan de Fuca independent streams (i.e., not the Elwha or Dungeness Rivers).

At this point, the task becomes that of estimating the pre-terminal exploitation rate. That was derived from a detailed cohort reconstruction, as discussed below. The cohort analysis covers brood years 1996 through 2007 (return years 1999 through 2010) because methods of estimating smolt production and escapement have been fairly consistent over those years. Tag recovery data and estimates of escapement are not yet complete for 2011, so the cohort analysis cannot yet cover 2011.

A-5.3.2 Cohort Abundance, Pre-terminal

Abundance of natural-origin coho recruits, as well as fishery mortality and exploitation rates, were derived from CWT-based cohort reconstruction of recruits from the Lower Elwha hatchery. The assumption behind this analysis is that Elwha hatchery coho are distributed in a similar manner, and therefore undergo a similar exploitation rate, as wild Strait of Juan de Fuca coho. The exception to this assumption is the effect of mark-selective fisheries on coho, which is discussed later.

Coded-wire tag data were obtained from the coastwide RMIS CWT database. Tag recoveries of Elwha hatchery coho were expanded for production expansion factors (total releases divided by tagged releases) and also for sampling expansion factors (for each fishery, roughly: total catch divided by sampled catch).

The cohort reconstruction also added in FRAM-compatible rates for non-landed mortality (separately for hook and net fisheries) and FRAM- compatible rates for natural mortality for each FRAM time period.

A-5.3.3 Cohort Abundance, Terminal

Estimates of escapement and terminal catch were obtained from RRTERM (through return year 2008) and from WDFW and tribal data sources for 2010. Using these estimates incorporates the assumption that the fish designated by RRTERM, and observed in spawner surveys as hatchery and natural originated from the hatchery and the gravel, respectively (not just that they spawned there as adults).

A-5.3.4 Exploitation Rate

For Elwha hatchery coho, exploitation rate for each brood year was estimated by summing fishery mortality for all fisheries, and then dividing by total cohort abundance, as shown in Equation (2) below.

(2)

$$ER_{BY\ hatchery} = \frac{Fishery\ Mortality_{BY\ hatchery}}{Cohort\ Abundance_{BY\ hatchery}}$$

Because mark-selective fisheries are assumed to exert a higher exploitation rate on marked coho than on unmarked coho, the estimate of exploitation rate for hatchery coho was scaled to one for natural coho by using the ratio of ER's for unmarked and marked coho from the Elwha hatchery, as calculated by the post-season FRAM for each year, as shown in Equation (3) below. Since post-season FRAM runs are currently available only through return year 2009, that scalar was calculated for return year 2010 using the final PFMC coho FRAM run.

$$ER_{BY\ wild} = ER_{BY\ hatchery} * \frac{ER_{BY\ hatchery\ unmarked\ FRAM}}{ER_{BY\ hatchery\ marked\ FRAM}}$$

A-5.3.5 Smolt Abundance

WDFW, the Lower Elwha Tribe, and the Makah Tribe have sampled coho smolts in streams tributary to the Strait of Juan de Fuca since 1998. The smolt counts from these sampled streams were expanded to estimate smolt abundance in all Strait streams based on stream width and length, which are taken as proxies for potential smolt-producing habitat.

A-5.4 Predicting Marine Survival

To predict marine survival, we examined 45 variables that appeared might be related to (although not necessarily cause) variation in marine survival.

Correlation analysis was used to determine which variables to focus on as indicators of marine survival. The following variables are significantly correlated with Strait of Juan de Fuca natural coho marine survival rates:

Table A-5-a. Variables Significantly Correlated with SJF Natural Coho Marine Survival

Variable	Correlation	P-value
ln(Elwha jack return rate)	0.733	0.007
September NOAA coho trawl CPUE	0.579	0.049
Copepod species richness anomaly	-0.617	0.032

Linear regression analysis confirmed that these variables are significant predictors of marine survival for Strait of Juan de Fuca wild coho ($P<0.05$). Any one of them by itself could be used to predict marine survival for these coho from brood 2009.

After more detailed examination of the correlation matrix, and confirmation that these independent variables were not correlated among themselves, we also developed a multiple regression model using ln (jack return rate) and copepod richness anomaly as independent variables.

A-5.5 Results and Prediction for 2012

Parameter estimates of the models are shown in Tables A-5-b and A-5-c. Depending on the selection of independent variables, we can get very different predictions of marine survival, and then of resulting cohort abundance.

The Elwha jack return rate was below average for brood year 2009, returning as age-3 adults in 2012. The positive coefficient for this variable indicates that, if we rely on this variable alone, we can expect a survival rate below average.

On the other hand, the copepod species richness anomaly, an indicator of species diversity, was negative in 2011, the year that the BY2009 smolts migrated to sea. A negative species richness anomaly for copepods is itself correlated with a higher northern copepod biomass, as well as higher marine survival for Strait of Juan de Fuca coho. Thus, if we relied on this variable alone, we might expect an above- average survival rate.

The NOAA September coho trawl CPUE was also somewhat below average in 2011. This variable is positively correlated with marine survival of Strait coho, suggesting that the marine survival rate for brood 2009 is below average.

The multiple regression model using ln (jack return rate) and the copepod richness anomaly shows a highly significant relationship ($P=0.01$) between marine survival and these two independent variables. This model also explains more of the variability in marine survival ($r2 = 0.73$) than either of the single-predictor models.

Table A-5-b. Data for Brood Year 2009

ln(Jack return rate), BY2009	-7.71
September Coho Trawl CPUE	0.3
Copepod Richness anomaly	-2.41
Smolts, BY 2009	305022

Table A-5-c. Strait of Juan de Fuca Natural Coho Summary of Forecast Model Results

	Ln(jack return rate)	**Coho Trawl CPUE**	**Copepod Richness**	**Multiple (ln-jack rtn, Copepod)**	**r-sq Weighted Mean**
Predicted marine survival rate	0.0383	0.0484	0.0684	0.0525	0.051
Predicted recruits (Jan age 3)	11,676	14,777	20,848	16,008	15,558
Predicted recruits (Ocn age 3)	9,477	11,994	16,922	12,994	12,629

r-sq value for model	0.54	0.33	0.38	0.73	

In order to reconcile the seemingly conflicting signals from these variables, we settled on a weighted mean marine survival rate of 5.1 percent. The weighting factor used was the r2 value for each of the three single-predictor models and the multiple regression model.

A-6. Eastern Strait of Juan de Fuca Natural Coho (WDFW)

The 2012 forecast of eastern Strait of Juan de Fuca wild coho were produced from an estimated marine survival rate for January age-3 (JA3) SJF wild coho recruits. The estimated JA3 marine survival rate was produced by regression of log transformed Elwha hatchery jack return rates to SJF wild coho marine survival rates (JA3). A conversion was applied to the JA3 survival rate to get an ocean age-3 (OA3) survival rate, which was applied to smolt production to estimate ocean age-3 recruits.

A-6.1 Dungeness River Natural Coho

Dungeness River 2011 wild smolt production was estimated to be 26,280 smolts by using a tag/recapture Peterson-type estimate. The wild smolt estimate was multiplied by the estimated ocean age-3 marine survival rate of 0.0414 to get a forecast of 1,088 ocean age-3 Dungeness River natural coho recruits.

Table A-6-a. Natural Dungeness River Coho Marine Survival and Recruits

Dungeness Nat. Coho Smolts		**26,280**
Recruit Classification	**Survival Rate**	**Recruits**
Jan. Age 3	0.0510	1,340
Ocean Age 3	0.0414	1,088

A-6.2 Elwha River Natural Coho

Elwha River 2011 smolt production was assumed to be consistent with Dungeness River production per available river length (0.526 smolts per linear yard). However, twice the mean production was assumed per linear yard because of the greater width of the lower Elwha River. Smolt production in the Elwha River was estimated to be 9,068 smolts. The wild smolt estimate was multiplied by the estimated ocean age-3 marine survival rate of 0.0414 to get a forecast of 375 ocean age-3 Dungeness River natural coho recruits.

Table A-6-b. Elwha River Length Available to Natural Coho

System	**Yards**	**Miles**
Mainstem Dungeness	33,088	18.8
Grey Wolf	16,896	9.6
Dungeness Total	49,984	28.4
Elwha River	**8,624**	**4.9**

Table A-6-c

Smolts/Yd	Width Factor	Yards	Smolts
0.526	2	8,624	9,068

Table A-6-d Natural Elwha River Coho Marine Survival and Recruits

Elwha Nat. Coho Smolts		9,068
Recruit Classification	**Survival Rate**	**Recruits**
Jan. Age 3	0.0510	462
Ocean Age 3	0.0414	375

A-7. Eastern Strait of Juan de Fuca Hatchery Coho (WDFW)

The Dungeness River and Elwha River hatchery coho forecasts were both predicted by multiplying total releases from each hatchery by an estimated marine survival rate for each hatchery stock. In 2011, the number of returning jacks decreased substantially from 2010 at all Strait and North Coast hatchery facilities, suggesting a lower survival than the 2010 return. A generally cool ocean produced indicators pointing to an overall near average ocean conditions.

A-7.1 Dungeness River Hatchery Coho

For the Dungeness River hatchery coho forecast, the mean estimated return rate for 2009 and 2010 of 0.0228 was used because the 2006 - 2008 marine survivals were very low, and the 2011 rate was not yet available.

Table A-7-a Dungeness River Hatchery Coho Releases by Mark and Tag Status

Releases	Ad + CWT	Ad Only	CWT only	No Mark/ No CWT	Total
Number	0	539,364	0	2,136	541,500
Percent	0.00%	99.61%	0.00%	0.39%	100.00%

Table A-7-b Dungeness River Hatchery Coho Marine Survival and Recruits

Total Hatchery Smolts	Marine Survival Rate	January Age-3 Recruits	Ocean Age-3 Conversion Factor	Ocean Age-3 Recruits
541,500	0.0228	12,346	0.8117	10,021

A-7.2 Elwha River Hatchery Coho

For the Elwha River hatchery coho forecast, the mean estimated return rate for 2009 and 2010 of 0.0207 was used because they better represent the prevailing ocean conditions, and the 2011 rate was not yet available.

Table A-7-c Elwha River Hatchery Coho Releases by Mark and Tag Status

Releases	Ad + CWT	Ad Only	CWT only	No Mark/ No CWT	Total
Number	80,405	265,825	80,086	0	426,316
Percent	18.86%	62.35%	18.79%	0.00%	100.00%

Table A-7-d Elwha River Hatchery Coho Marine Survival and Recruits

Total Hatchery Smolts	Marine Survival Rate	January Age-3 Recruits	Ocean Age-3 Conversion Factor	Ocean Age-3 Recruits
426,316	0.0207	8,825	0.8117	7,163

A-8. Fall Chum Salmon (WDFW & PNPTC)

A-8.1 Natural Fall Chum Salmon WDFW Forecast

Natural origin fall chum forecasts for Hood Canal and Strait of Juan de Fuca were calculated using the Puget Sound-wide recruit/spawner (R/S) method, with regional forecasts allocated according to parent escapement and terminal forecasts allocated by escapement goal.

The resulting wild chum forecast for Puget Sound is 629,091. This method predicts returns of 898 natural-origin fall chum to Strait of Juan de Fuca.

Table A-8-a. Distribution of SJF Nat Fall Chum Prediction by SJF Proportion of Puget Sound Parent Escapement

Return Age	BY	BY Parent Escapement	% of Puget Sound Esc.	Expected Age Breakout
Age 3	2009	433	0.18%	457
Age 4	2008	499	0.10%	288
Age 5	2007	1,271	0.15%	153
			Total Return	**898**

Table A-8-b. Distribution of Natural Fall Chum Runsize Estimates to Terminal Areas by Escapement Goal Ratio

Terminal Area	Odd Yr Goal	Proportion	Expected Recruits
Pysht R.	1650	0.458	411
Deep Cr.	500	0.139	125
Dungeness R.	500	0.139	125
Misc.	950	0.264	237
		Total Return	**898**

A-8.2 Natural Fall Chum Salmon Tribal Forecast

The 2012 SJF natural fall chum Tribal forecast is a preliminary attempt to develop a forecast method that combines ocean and freshwater environmental variables with the spawner-recruit relationship. At this time the mechanisms underlying the influence and timing of the environmental variables have not been fully explored or explained, therefore even though the independent variables are statistically significant, there is an increased risk that one or more may not be causative.

The forecast model is a multiple regression with four independent variables: (1) spawner-recruit relationship, (2) maximum winter river flow, (3) upwelling, and (4) Pacific Decadal Oscillation (PDO). All variables were statistically significant ($p<0.05$). The base period for the model covers 1989 through 2010 with no years removed (22 years total). The overall model R2 value is 0.77, with an adjusted R2 of 0.71.

The four independent variables:

(1) *Beverton-Holt Spawner-Recruit Curve* fit to total recruits from brood years 1980-2005. The spawner-recruit relationship was then applied to brood year escapements for 2007-2009 to obtain predicted total recruits for those brood years; then each brood year recruit estimate for the years 2007 to 2009 was apportioned to the 2012 return year according to the long-term average age composition for each age class.

(2) *Maximum Average Daily River Flow for November through March for the Dungeness River and Elwha River* for the brood year of age-4 returns. The model input was the average of the Dungeness and Elwha maximum flows.

(3) *Coastal Upwelling (latitude 48, May-July average)* three years prior to the return year.

(4) *PDO May-June Average for three years prior to the return year*. The averaged PDO index values for the returning 3s, 4s, and 5s were apportioned, or weighted, to the 2012 return year model input according to long-term average escapement age composition.

For 2012, the modeled point estimate is **894** SJF natural fall chum, with an expected range (+- 1 srmse) for the run size of between 25 and 1,763. The total SJF forecast was apportioned to the individual stocks on the basis of historical escapement survey data which resulted in the following proportions: Pysht River (46%), Dungeness River (14%), Deep Creek (14%), and miscellaneous (including Elwha R. and Lyre R.) (26%).

A-8.3 Hatchery Fall Chum Salmon

The fall chum hatchery forecasts were based on pounds of fry released and average hatchery-specific return rates. The 2012 Strait of Juan de Fuca forecast is **305** hatchery fall chum.

A-8.4 Joint Fall Chum Salmon Forecast

Natural Fall Chum: **897**

The WDFW forecast of 898 natural fall chum is extremely close to the Tribal estimate of 894 (4 fish difference). The agreed to 2012 Strait of Juan de Fuca of 897 natural fall chum forecast is the two estimates averaged and rounded up to the nearest whole fish.

Hatchery Fall Chum: **305**

B. Inseason Run Assessment Methods

The Dungeness River coho salmon is the only run among those returning to the Strait of Juan de Fuca tributaries for which an acceptable model for estimating inseason abundance has been developed. For all other runs the preseason forecast will serve as the inseason estimate of abundance.

B-1. Dungeness Coho Salmon

Prior to October 11, the preseason terminal run size forecast will serve as the estimate of the run entering Dungeness Bay (Area 6D). For the Dungeness River coho salmon, run size updates will be estimated on October 9 using catch and effort data through October 8, if there has been sufficient fishing effort through October 8. Fishing effort and harvest will be considered sufficient if more than 30, but less than 40, fisher days have occurred for the period under consideration. The update will be based on a linear regression model relating total terminal run size (including all terminal and extreme terminal commercial and recreational catches and escapements) to cumulative catch per cumulative effort (treaty and nontreaty) in Area 6D. The regression is based on run sizes and catches from the 1985 - 2007 period. However, from that period, only years in which the cumulative effort through 10/8 was between 30 and 40 units were used. Therefore the data series was limited to the 2000 through 2007 period. This was done to better approximate the current level of fishing effort. The selected data appear in Table B-1-b in boldface. The update model for October 8 is as follows:

6D Run Size = 623.7 + (205.1 * CC/CE through 10/8)

The updated run abundance entering the terminal area will represent the total abundance. The hatchery to natural ratio shall be assumed to be as forecast preseason.

Table B-1-a shows the regression statistics for the update model. Table B-1-b shows the data series used to develop this model. The database used to develop this model includes catches and effort (fisher-days) by gillnets (treaty and non-treaty) from the observed years.

Table B-1-a. Summary Statistics of the Area 6D Inseason Abundance Estimation Model (based on run sizes and catches from the 1985 - 2007 period)

Using Data through October 8	
P ($\beta1=0$)	0.0056
R2	0.747
Sqr.Root MSE	7683.3
N	8
$\beta0$	623.677
$\beta1$	205.116

Table B-1-b. Inseason Coho Abundance Estimation Data for Area 6D.

Year	Dungeness Bay Run Size			Cum. Catch	Cum. Effort	CC/CE
	Hatchery	Natural	Total	Through 10/8		
1979	5,035	1,387	6,422			
1980	13,513	3,721	17,234			
1981	16,534	4,553	21,087			
1982	21,815	6,007	27,822			
1983	10,279	2,830	13,109			
1984	1,092	301	1,393			
1985	3,708	1,021	4,729	817	45	18.16
1986	4,725	1,301	6,026	2,637	67	39.36
1987	5,935	1,634	7,569	2,476	60	41.27
1988	5,006	1,378	6,384	2,705	88	30.74
1989	5,474	1,507	6,981	2,524	62	40.71
1990	4,477	1,233	5,710	1,304	59	22.10
1991	4,496	1,238	5,734	2,099	73	28.75
1992	2,835	781	3,616	772	47	16.43
1993	3,321	914	4,235	95	15	6.33
1994	2,496	687	3,183	804	18	44.67
1995	7,940	2,186	10,126	595	17	35.00
1996	7,912	2,179	10,091	695	15	46.33
1997	12,806	3,526	16,332	203	8	25.38
1998	7,599	2,092	9,691	2,638	28	94.21
1999	4,289	1,181	5,470	665	14	47.50
2000	25,444	7,006	32,450	6,977	36	193.81
2001	31,777	8,750	40,527	4,951	38	130.29
2002	10,458	2,880	13,338	1,498	31	48.32
2003	16,284	4,484	20,768	2,313	31	74.61
2004	5,696	1,568	7,264	1,287	38	33.87
2005	4,111	1,132	5,243	926	38	24.37
2006	1,271	350	1,621	686	30	22.87
2007	4,639	1,276	5,915	2,423	36	67.31
2008	950	260	1,210	523	52	10.06
2009(1)	14,571	4,747	19,318			
2010(1)	2,252	621	2,873			
2011(1)	12,193	3,357	15,550			

(1) The area 6D coho inseason update model has not been used since 2008.