2009 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
Washington Department of Fish and Wildlife

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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, 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 2009 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 understanding of the 2009-10 State/Tribal Agreed to Fisheries Document, NWIFC, April 2009.

This preseason management framework plan outlines the forecasted total abundance for each salmon species by management unit, except fall chum salmon. Fall chum salmon forecasts include only fish taken in net fisheries and escapement, and exclude harvests not taken in net fisheries (troll, recreational, ceremonial and subsistence) and non-landed mortalities. 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 2009 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 the 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 for other runs and/or species in pre-terminal and terminal areas. During 2009 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 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. The methods used to derive 2009 preseason forecasts are detailed in Appendix A of this report. 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 target escapement rates established in the *Summer Chum Salmon Conservation* Initiative (SCSCI). For Chinook salmon, the targets are those established in the *Puget Sound Comprehensive Chinook Management Plan* (PSCCMP). 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%) for the 2009 forecasted recruitment under the stepped exploitation rate management approach used for Strait of Juan de Fuca natural (primary) coho.
Expected escapements are those that would result from the stated forecasts after fisheries consistent with the parties' preseason planned management framework have been conducted.

Except for Dungeness River and Elwha River origin coho, no salmon runs returning to the Strait of Juan de Fuca tributaries in 2009 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 to limited fisheries, while striving to maintain protective and rehabilitative measures for the Strait of Juan de Fuca salmon returning to natural spawning areas (See Section 4.0 of this report).

2. 2009 Fishery Management Periods

Area	Chinook	Summer Chum	Coho	E. Fall Chum	L. Fall Chum	Winter Steelhead
6D & Dungen. I	07/26-09/19	---	09/20-10/24	10/25-11/28	---	11/29-03/31
Dungeness II	08/09-09/19	---	09/20-10/24	10/25-12/12	---	12/13-04/15
Elwha	07/19-09/12	---	09/13-11/07	11/8-12/05	---	12/06-04/15
Discovery-Sequim Tributaries	---	09/16-10/24	10/25-12/29	---	---	11/29-04/30
Hoko-Sekiu	09/06-11/10	---	09/28-11/14	11/15-12/05	---	12/06-03/31
Misc. SJF Tributaries	09/06-11/10	---	09/28-11/14	11/15-12/12	11/30-12/31	11/29-04/15

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). 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

Strait of Juan de Fuca Chinook Salmon Management / Production Units

Fishery	Elwha R.	Dungeness R.	Hoko R.	Total
	Aggregate	Supplemented	Supplemented	
Recruits (Catch + Esc)	3,191	1,358	1,346	5,895
Canada	941	400	149	1,490
Alaska	239	102	118	459
S.Falcon Tr/Rec	0	0	0	0
N.Falcon Tr/Rec	11	5	0	16
P.S. Troll	14	6	8	28
No. Snd + Strait Recreational	32	13	37	82
Cntl. + So. Sound Recreational	34	15	1	50
Puget Sound Net	29	12	18	59
Out of Region Net	10	4	0	14
6D Net	0	2	0	2
FW Net	4	0	0	4
FW Recreational	0	0	0	0
Mgmt Unit Harvest	1,314	559	331	2,204
Extreme Term. Nat. Mort.	13	13	0	26
Expected Escapement	1,877	799	1,015	3,691
Escapement Goal	2,900	925	1,050	4,875
Low Abundance Threshold	1,000	500 Nat.	500 Nat.	2,000

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 #2309. The initial Dungeness River forecast was for Chinook salmon expected to return to the terminal area. The Elwha run was forecast as a single unit because a portion of the progeny of natural spawners is taken for hatchery brood stock, and conversely, a portion of the hatchery return spawns in the river. Methods used to forecast the Dungeness, Elwha and Hoko River runs are further detailed in Appendix A-1 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 Comprehensive Chinook Management Plan-Harvest Management Component, which given the forecasted 2009 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 #2309, 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

Production Unit	Forecast Type	Total Recruits	CDN Harvest	WA Pre-terminal Harvest	Expected Escapement	Escapement Target
Chimacum Creek	Tribal	1,053	66	26	960	91.2 % of recruits
	WDFW	1,003	63	25	915	
Discovery Bay	Tribal	4,004	252	100	3,652	91.2 % of recruits
	WDFW	3,252	205	81	2,966	
Sequim Bay	Tribal	943	59	24	860	91.2 % of recruits
	WDFW	943	59	24	860	
Totals	Tribal	6,000	378	150	5,472	
	WDFW	5,198	327	130	4,741	

The methods used to develop the 2009 forecasts of summer chum salmon returning to the streams of Discovery Bay and Sequim Bay are detailed in Appendix A-3 of this report. The escapement rate targets of the Base Conservation Regime (BCR), of the Summer Chum Salmon Conservation Initiative, are those which would result on the average given application of the exploitation rate based regime. The 2009 summer chum run was forecast by two separate methods, outlined in Appendix A-3 of this report, as total recruits to all fisheries and escapement. Briefly, the two methods differ in that one approach relied on the mean total recruitment of recent years while the second relied on the mean of recent years' natural origin recruits only (except for the Sequim MU). Both methods produced estimates above the critical abundance threshold and are listed above. The 2009 forecast of these returns is based on only a few years' data, therefore it should be considered conservatively.

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 2009. Other runs, while indicating a harvestable surplus in the aggregate, are composed of numerous small components.

Fishery	Strait of Juan de Fuca Coho Salmon Management / Production Units						Total
	Miscellaneous Natural		Elwha R.	Dungeness R.	Subtotals		
	Eastern Natural	Western Natural	Aggregate[(1)]	Aggregate[(1)]	Natural	Hatchery & Sec. Natural	
Recruits	3,247	17,286	1,606	5,804	20,533	7,410	27,943
Canada	50	263	46	205	313	251	564
Alaska	5	30	3	10	35	13	48
S.Falcon Tr/Rec	6	28	5	32	34	37	71
N.Falcon Tr/Rec	141	761	93	381	902	474	1,376
P.S. Troll	5	22	1	6	27	7	34
Strait Rec.	119	634	99	420	753	519	1,272
SJI Rec.	0	0	0	0	0	0	0
Admiralty Rec.	3	22	1	7	25	8	33
N. Sound Rec.	0	0	0	0	0	0	0
S. Sound Rec.	1	7	0	2	8	2	10
Hood Canal Rec.	0	0	0	0	0	0	0
Strait Net	27	146	11	44	173	55	228
San Juans Net	14	76	5	21	90	26	116
Admiralty Net	0	0	0	0	0	0	0
No. Sound Net	0	2	0	1	2	1	3
So. Sound Net	1	12	0	3	13	3	16
Hood Canal Net	6	37	0	10	43	10	53
SJF Rivers Rec.	0	0	151	694	0	845	845
6D Net	0	0	0	1,741	0	1,741	1,741
Elwha/Dungeness Net	0	0	160	238	0	398	398
Miscell. Net	0	16	0	0	16	0	16
Mgmt Unit Harvest	378	2,056	575	3,815	2,434	4,390	6,824
Mgmt Unit Exp. Escapement	2,869	15,230	1,031	1,989	18,099	3,020	21,119
Min. Escap. Goal	1,948	10,372	1,330	729	12,320	2,059	14,379

Notes: (1) For 2009, the Elwha R. "pre-season Aggregate" is composed of 12.6% secondary wild, and 87.4% hatchery coho salmon. The Dungeness R. "pre-season Aggregate" is composed of 9.9% secondary wild and 90.1% hatchery coho salmon.

Methods used to develop the forecasts for the 2009 season are summarized in Appendix A-4 of this report. Expected harvest numbers refer to the total anticipated harvests from both incidental and targeted fisheries which were modeled preseason in FRAM run #0921. In 2009, given the expected returns of coho to the Strait primary units, the tribal and state co-managers considered the significantly lower expected interceptions in Canadian fisheries 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

Production Unit	"4B" Run	Pre-Terminal Harvest	Terminal Run	Extr. Terminal Harvest	Expected Escapement	Escapement Goal
Dungeness R.	359	47	312	0	312	500
Deep Creek.	359	47	312	0	312	500
Pysht River	1,186	155	1,031	8	1,023	1,650
Miscellaneous	683	36	647	15	633	900
Totals	2,587	285	2,302	23	2,279	3,550

Methods used to develop the forecasts of fall-timed chum salmon returning to the Strait of Juan de Fuca streams in 2009 are detailed in Appendix A-5 of this report. The final forecast for 2009 is the average of the forecast results, for each individual unit, obtained by PNPTC and WDFW, using different forecasting methods, shown in Appendix A-5 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 2009, 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.

4. Preseason Management Framework

4.1 2009 Harvest Management Measures and Expected Fisheries

In 2009, the condition of the salmon runs returning to the Strait of Juan de Fuca terminal areas requires that harvest management plans be conservative in all respects. The expected return of most runs in 2009 is very low and only coho salmon returning to the Elwha and Dungeness areas will be sufficiently abundant to warrant directed fisheries, within the constraints of low status exploitation rate limits. In particular, the restrictions on Canadian fisheries (designed to protect British Columbia coho salmon), combined with improved escapements of wild coho to Strait streams, have provided the opportunity to implement exploitation rate based management for wild coho by adopting conservative management practices.

The following section provides a summary of the co-managers' preseason understandings, regarding the fishery regimes to be used in 2009. These regimes were used during the preseason planning process for discussions and simulation modeling in an effort to achieve the co-managers' intent for harvest and escapements. It will be used as management guidance during the season and may be adjusted in response to information that modifies one or more of the preseason assumptions.

4.1.1 Preseason Framework for Commercial Fisheries

Areas 5, 6, 6C Treaty Troll (Ntrty net closed)
NOTE: For Area 4B: 5/1-10/31 see Ocean Troll. For 11/1-12/31 and 1/1-4/15 see below

5/1-6/17	Closed
6/18-9/30	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 through April 15, or when catch reaches the harvest guideline of 8500 Chinook, whichever comes first. 1,000-foot closures around stream mouths. A lower number was modeled in Chinook FRAM #2309 as per co-manager agreement; however, the fishery will be managed for the harvest guideline of 8500 Chinook.
4/16-4/30	Closed

Areas 4B, 5, & 6C Treaty Net (Ntrty net closed)

Chinook	Open for setnet gear only, 6/21 through 8/15; 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/Pink	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 and pink 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 inseason 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 and pink salmon. If inseason 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 (inseason adjustments based on cumulative catch) from the end of Fraser Panel control, through 10/10; 1,000 ft. closure around stream mouths. The gillnet catch number listed in FRAM #0921 will be used as management guideline and should not be greatly exceeded.
Chum	Open for gillnets, starting at 6 days per week (days may be added if effort is low), 10/11 through 11/14; 1,000-foot closure around stream mouths.

Area 6D Dungeness Bay Net

Chinook	All	Closed
Pink	All	Closed
Coho	Trty	Open 9/21 through 11/24; additional openings possible based on inseason information; Chinook and chum release and gillnets may fish daytime only, gillnets must be attended to by fisher, through 10/10; 1,500 ft closure around each river mouth.

	Ntrty	Open Wk 39 (wb 9/20) through Wk 43 (wb 10/18) for skiff gillnet gear; 7AM – 7PM, 5 days each week (M-F); Chinook and chum release by cutting ensnaring meshes; 1,500 ft. (1/4 nautical mile) closure around each river mouth. Additional openings possible in wb 10/25 based on inseason information.
Chum	All	Closed

Dungeness River Treaty (Ntrty net closed)

Chinook	Trty	Closed
Pink	Trty	Closed
Coho	Trty	Commercial fishing up to 3 days/wk, to be determined inseason, 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	Open 9/13 through 11/7; days per week to be determined inseason.
Chum	Trty	Closed

4.1.2 Preseason Framework for Recreational Fisheries

Area 5 Recreational

5/1-6/30	Closed
7/1-8/15	2 fish limit, plus 2 additional pink salmon (Chinook 22" min size); unmarked Chinook, unmarked coho, and chum release. South of the Kydaka Pt./Shipwreck Pt. line – closed to salmon angling.
8/16-9/18	2 fish limit, plus 2 additional pink salmon; Chinook, unmarked coho, and chum release. South of the Kydaka Pt./Shipwreck Pt. line – closed to salmon angling.
9/19-9/30	2 fish limit; Chinook and chum release. South of the Kydaka Pt./Shipwreck Pt. line – closed to salmon angling.
10/1-10/15	2 fish limit, 1 Chinook (Chinook 22" min size).
10/16-2/12	Closed
2/13-4/10	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, plus 2 additional pink salmon, (Chinook 22" min size); unmarked coho, chum, and Chinook release, 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, plus 2 additional pink salmon; Chinook, unmarked coho, and chum release. 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.)

11/12/12 Closed
2/13- 4/10 1 fish limit (Chinook 22" min size). Dungeness Bay closed to salmon angling.
4/11-4/30 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 (mouth to Aldwell Lake Dam)
3/1 – 9/30 Closed to all fishing.
10/1 – 2/28/09 Trout and other game fish open.
10/1 – 11/15 6 fish limit, coho only; no more than 4 adults; 12" min. size

Hoko River Recreational (mouth to cement bridge (mile 7.0) on Hoko/Ozette Hwy.)
All yearClosed to salmon.
6/1 – 3/15/09 Trout and other game fish. (Fly fishing only 9/1 – 10/31)

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

4.1.3 Test Fisheries

No test fisheries, directed at salmon, are anticipated in any Strait of Juan de Fuca terminal areas, during the 2009 season.

4.2 Other Recommended Measures

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

Intensive spawner surveys in summer chum drainages (Discovery Bay, Sequim Bay, Chimacum Creek, Dungeness River) should be continued in 2009 to determine the number, age, sex ratio, and distribution of spawners. In the Dungeness system, sufficient information concerning summer chum salmon is lacking, therefore surveys of similar intensity and scope should be conducted. Mixed stock fisheries directed at other species should be monitored and sampled for otolith marked chum salmon (from the various supplementation programs) to gain information on the incidence and origin of summer chum interceptions. The in-stream supplementation program utilizing native spawners in JimmyComeLately Creek should be continued.

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 2009 run will include 5 year olds returning from the last juveniles (BY 2004) 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 2009, releases of smolts should be tagged, using CWT's. Consideration should be given to removing the adipose fin from a portion of the release to ensure that these fish are sampled if taken in Alaska and/or British Columbia fisheries. Their downstream emigration should be monitored using smolt traps. Finally, studies to determine critical freshwater habitat for this species should be implemented.

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

In the Elwha River, a tribal project designed cooperatively with the USNPS, the USFWS, and the WDFW, is aimed at the restoration of native fall chum salmon and will collect up to 75,000 fall chum salmon eggs (depending on availability). Eyed eggs from the captured brood will be distributed to in-stream incubators, in Bosco Slough and Boston Charlie creeks.

Although none have been proposed for 2009, limited test or evaluation fisheries and 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.

4.3 Inseason Run Size Updates

During the 2009 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 of terminal run abundance will be performed if satisfactory cumulative catch per cumulative effort information from the gillnet fishery in area 6D is available. Methods that will be used to derive the inseason estimate, for 2009 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.

APPENDIX

A. Preseason Forecasting Methods

B. Inseason Run Assessment Methods

A. Preseason Forecasting Methods

A-1. Chinook Salmon

Given that the forecasted returns of the Elwha and Dungeness components of Strait of Juan de Fuca Chinook salmon are being entered into the FRAM simulation model as a single population, the 2009 forecasted return of Elwha and Dungeness to the terminal areas was forecasted as a single quantity, which was then apportioned to individual populations based on recent years' performance. This approach is believed to lessen the errors caused by summing individual stock forecasts. The forecast was made using the mean terminal area return in the last four years (2005 - 2008) and was also apportioned using the relative distribution in the same period, which may better reflect recent survival rates and the changing proportional contribution from the Dungeness stock. The resulting TRS forecast for 2009 is 2,435 for these two systems (Table A-1-a), apportioned to Elwha (1,708), and Dungeness (727) (Table A-1-b). For 2009, it became possible to enter the Hoko River forecast separately into the preseason simulation model. Therefore, the Hoko Chinook were forecasted as ocean recruits to all fisheries and escapement, as outlined in Section A-1.3 of this summary.

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

Year	Elwha	Dungeness	Strait ETRS
1986	3,159	254	3,413
1987	6,220	133	6,353
1988	8,667	372	9,039
1989	5,704	95	5,799
1990	3,606	361	3,967
1991	3,761	199	3,960
1992	4,002	154	4,156
1993	1,669	54	1,723
1994	1,580	65	1,645
1995	1,814	163	1,977
1996	1,877	183	2,060
1997	2,544	52	2,596
1998	2,462	110	2,572
1999	1,642	75	1,717
2000	1,913	218	2,131
2001	2,246	453	2,699
2002	2,416	633	3,049
2003	2,305	640	2,945
2004	3,439	1,014	4,453
2005	2,242	1,081	3,323
2006	1,931	1,543	3,474
2007	1,153	403	1,556
2008	1,157	229	1,386
2009 Forecast (2005-08 Avg.)			**2,435**

Table A-1-b. Proportional Distribution of Strait of Juan de Fuca.

Elwha - Dungeness Chinook TRS

Year	Elwha	Dungeness
1986	0.926	0.074
1987	0.979	0.021
1988	0.959	0.041
1989	0.984	0.016
1990	0.909	0.091
1991	0.950	0.050
1992	0.963	0.037
1993	0.969	0.031
1994	0.960	0.040
1995	0.918	0.082
1996	0.911	0.089
1997	0.980	0.020
1998	0.957	0.043
1999	0.956	0.044
2000	0.898	0.102
2001	0.832	0.168
2002	0.792	0.208
2003	0.783	0.217
2004	0.772	0.228
2005	0.675	0.325
2006	0.556	0.444
2007	0.741	0.259
2008	0.835	0.165
2005 - 08 Avg.	0.702	0.298
2009 Forecast Distribution	1,708	727

A-1.1 Dungeness River Natural

Table A-1-c. Dungeness River Chinook Salmon Forecast Data

Return Year	Natural Escape.	Brood-stock	Pre-spawn. Mort.	Area 6D Harvest	FW Recr. Catch	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

A-1.2 Elwha River

Table A-1-d. Elwha River Chinook Salmon Forecast Data.

Return Year	Extreme Terminal Run	Natural Spawning Escapement	Hatchery Broodstock	Pre-spawning Mortality	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	2,544	1,585	942	10	7
1998	2,462	720	1,689	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

Harvest does not include Recreational Catch
(*) The 2007-08 estimates are preliminary and subject to revision
Note: The 1986 - 1996 values are currently under review for accuracy and may be modified

Table A-1-e. Elwha River Chinook Nat. and WDFW Rearing Channel Pre-spawning Mortalities

Return Year	Hatchery Voluntary Escapement	Natural Spawners	In-River Gross Escapement	Gaff-Seine Removals	In-Hatchery Pre-spawning Mortality	In-River Pre-spawning Mortality
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

Note: The 1986 - 1996 values are currently under review for accuracy and may be modified

In order to estimate the potential effective escapements in 2009, the forecasted return to the Elwha River was further apportioned, using the 2005-2008 mean proportions (Table A-1-e), as follows: Of the forecasted 1,708, **0.2%** (4) are expected to be harvested; **13.7%** (234) are expected to voluntarily return to the Elwha Rearing Channel, and **86.1%** (1,470) to the river. The voluntary hatchery return is expected to be reduced by **5.2**% (12), to account for average on-station pre-spawning mortality, leaving 222 effective hatchery spawners. The in-river escapement was not reduced for in-river pre-spawning mortality, based on recent years' survival. However, the 1,470 in-river escapement was reduced by **57.4%** (843) to account for broodstock removals (gaff & seine), leaving an anticipated in-river spawning escapement of 626 Chinook salmon and an anticipated effective hatchery broodstock total of 1,065.

A-1.3 Hoko River (Makah)

The 2009 forecast abundance of Hoko River Chinook is 969 mature ocean recruits, or 12,167 total ocean recruits. The estimate of total ocean recruits is in units suitable for input as the initial cohort size in FRAM.

Two methods were used for predicting recruits, methods which differed by age class. Age-2 recruits were predicted as the mean of the previous 5 years of Age-2 recruits. For ages 3, 4 and 5, recruits were forecasted were developed from linear regression models based on estimated sibling abundance in 2008. The regression models to forecast these age classes are based on statistically significant linear relationships ($P<0.05$) between $recruits_{age\text{-}1,\ RY\text{-}1}$ and $recruits_{age,\ RY}$. For age-6 recruits, those linear regression models were not significant; instead age-6 recruits were predicted as the mean of the previous 5 years of recruits of those ages.

Hindcasting with these regression models reveals that they perform well in predicting abundance. Excluding fish ages 2 and 6, and limiting the hindcasting to the years since after 1994, when the missing 1988 brood year was no longer present, the average error for total ocean recruits by return year is 47 fish. Historically, ages 3 through 5 have comprised 94 percent of the recruits to this stock, so errors associated with using the 5-year mean for ages 2 and 6 are not likely to make a great difference in this forecast.

The age-breakout of the forecast is shown in Table A-1-f.

Table A-1-f. Hoko River 2009 Forecast of Chinook Salmon, by Age

Age	Total Recruits	Maturation Rate	Mature Recruits
2	9,355	0.0033	30
3	1,225	0.0979	120
4	1,289	0.3802	490
5	245	1.0000	245
6	53	1.0000	53
7	0	1.0000	0
Totals	12,167		969

Table A-1-g. Hoko River 2009 Return Year Reconstruction

Age	Mature				Immature + Mature	
	Escape.	Esc.+Fmort[1].	Nat. Mort Factor	Total Maturing Recruits[2]	Immat. Factor[3]	Total Recruits
2	5	6	1.3594	8	280.41	2,317
3	22	26	1.3594	35	8.44	298
4	62	72	1.3594	98	2.14	212
5	394	460	1.3594	626	1.00	626
6	0	0	1.3594	0	1.00	0
Total	483	564		767		3,453
	2008 ER	0.1443				

Notes: 1: 2008 escapement + fishery mortality are estimated from escapement as Esc/(1-ER) where ER = mean of RY 2002-2006 ERs (see text for more detail) and escapement from surveys + hatchery broodstock.
2: 2008 Recruits estimate includes natural mortality that would be subtracted out by FRAM
3: Multiplier to include immatures is not exactly the same number as in the FRAM maturity schedules. The multiplier here accounts for the immature fish that are already included in the "Esc + Fmort" estimate.

Table A-1-h. Estimation of 2009 Hoko Chinook Recruitment

Age	Hatchery		Natural	Hat. + Nat.	Adjusted[5] Total Recruits	Total Mature Recruits
	Mature+ Fmort	All	All[4]	All		
2	19	5,884	3,471	9,355	9,355	30
3	92	770	454	1,224	1,225	120
4	308	871	514	1,385	1,289	490
5	158	154	91	245	245	245
6	34	34	20	54	53	53
Total	611	7,713	4,550	12,263	12,167	969

Notes: 4: Multiplier to estimate natural origin from supplemental origin Hoko Chinook:0.59. This multiplier is the mean of that ratio for return years 1989-2006.
5: "Adjusted" forecast of total recruits includes change in 4 year olds, scaling them from predicted mature recruits, rather than from regression model using 2008 total ocean 3 year olds.

The 2009 forecast was developed from sibling linear regressions based on a reconstruction of the estimated 2008 recruits. Although we have conducted a coded-wire-tag based cohort reconstruction for previous brood years and return years of Hoko Chinook, the 2008 CWT recovery data are not yet available. In order to estimate the 2008 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) $$ESC_{RY} = R_{RY} (1\text{-}ER_{RY})$$

This equation can be rearranged to estimate recruitment from escapement and exploitation rate, as indicated in Equation (2).

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

In order to assess past years' Chinook cohorts, we used CWT recovery data to estimate the exploitation rate. For the 2008 return, however, in the absence of recent-year CWT data, we estimated the exploitation rate used in this forecast as the mean exploitation rate for the five most recent years of complete CWT recovery data (2002 through 2006). These years almost correspond with the parent-years of this year's return. The mean ER was adjusted to reflect the differences between 2008 Chinook catch and the 2002-2006 means Chinook catch in fisheries in southeast Alaska and on the west coast of Vancouver Island. 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 rate for Hoko Chinook in Washington and Oregon fisheries, because the yare not major sources of mortality for Hoko Chinook.

Using the preliminary estimate of 483 Chinook spawners in 2008 and an estimated 2008 total ER of 0.1443, we derived an estimate of 767 mature ocean recruits, or 3,453 total ocean recruits (mature + immature) in 2008. These recruits were broken out into age classes based on scales sampled from in-river spawners and hatchery broodstock in the Hoko in 2008. All scales were read by the WDFW scale lab.

Ocean recruits in 2009 were predicted by age group (for ages 3 through 5) using sibling linear regression models based on CWT- reconstructed recruit estimates from return years 1989 through 2006. These years were used for the database because 1989 was the first year that tagged 4-year-olds returned to the Hoko, and 2006 was the most recent year for which complete CWT recovery data are available. In these sibling regression models, 3-year-olds in 2008 are forecasted from 2-year-olds in 2007, and so on for each age group, except as mentioned previously, for ages 2 and 6.

Ages 2 and 6 recruits were forecasted as the mean of the most recent five reconstructed years of recruit abundance. Because there were no recoveries of age-1 siblings in 2008, the forecast of age-2 was taken as the mean of the estimated age-2 recruits for the years 2001 through 2005. 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 5-year mean of 6-year-old recruits.

All age classes, from 2 through 6, were forecasted in two "units of fish". The first, termed "Mature Recruits" is in terms of natural mortality + fishery mortality + escapement, and can be considered the run size that we have to work with in 2009. The second estimate includes the mature recruits, plus immature fish (*i.e.*, fish that may contribute to the 2009 harvest but will not contribute to escapements). These were also forecasted using sibling regression models, but in these forecasts the independent variable was the 2008 recruits also estimated in terms that include immatures, using the FRAM age-specific maturity schedule for Hoko Chinook. 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 that will not contribute to the spawning escapement, or therefore to ER calculations, in 2009.

Initially, all age classes were forecasted as supplemented (*i.e.*, hatchery-origin) recruits only, because the tagged fish have all been tagged at the hatchery. These forecasts were then expanded to include natural-origin recruits by using a scalar based on the historical ratio of natural- to hatchery-origin recruits in the Hoko. 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 were combined, and final forecast does not distinguish between hatchery- and natural-origin recruits

A-2. Pink Salmon

A-2.1 Natural Runs

Naturally produced Puget Sound pink salmon were forecast for 2009 using cycle year return per spawner rates. The biennial nature of pink salmon returns result in three distinct groupings of brood year returns (Table A-2-a). The 2009 return of pink salmon to the Dungeness River was forecast by applying the mean Cycle 1 return rate (1.83) to the 2007 parent brood escapement (6,223). This resulted in an estimated return of 11,360 natural Dungeness pink salmon total recruits. The return-per-spawner rate from the 1961 (Cycle 2) and the 1963 and 1999 broods (Cycle 3) were excluded from the calculation of mean return rates, as outliers (Table A-2-b). A few additional recruits may return to the Elwha River, but given their occasional returns in recent years, they have not been quantified.

Table A-2-a. Corrected Pink Salmon Run Reconstruction for the Dungeness River

Run Year	Escapement	Terminal Run	Total Recruits
1959	40,000	40,000	64,603
1961	70,000	70,000	90,964
1963	**400,000**	**400,000**	**954,051**
1965	**70,000**	**75,000**	**105,640**
1967	95,000	117,400	213,494
1969	14,400	14,400	20,425
1971	46,000	46,000	63,576
1973	47,000	47,000	76,423
1975	24,500	24,900	39,618
1977	35,500	35,600	61,687
1979	50,000	57,800	130,182
1981	2,900	2,900	5,532
1983	4,888	4,888	5,630
1985	4,730	4,730	6,477
1987	1,906	1,906	2,303
1989	10,902	10,902	17,780
1991	9,895	9,895	15,017
1993	1,695	1,695	1,903
1995	8,252	8,252	10,446
1997	4,935	4,935	8,678
1999	7,306	7,306	7,393
2001	**80,344**	**80,344**	**83,832**
2003	15,116	15,245	15,861
2005	8,687	8,687	8,919
2007	6,223	6,462	6,632

Table A-2-b. Dungeness River Pink Salmon Returns per Spawner

Cycle 1 BY	Cycle 1 R/S	Cycle 2 BY	Cycle 2 R/S	Cycle 3 BY	Cycle 3 R/S
1959	2.27	**1961**	**13.63**	**1963**	**0.26**
1965	3.05	**1967**	0.22	**1969**	4.42
1971	1.66	**1973**	0.84	**1975**	2.52
1977	3.67	**1979**	0.11	**1981**	1.94
1983	1.33	**1985**	0.49	**1987**	9.33
1989	1.38	**1991**	0.19	**1993**	6.16
1995	1.05	**1997**	1.50	**1999**	**11.47**
2001	0.20	**2003**	0.59	**2005**	0.76
Average:	1.83		0.56		4.19
Std.Dev.	1.12		0.49		3.16
2009 PNPTC Forecast (CY 1) Recruits					11,360
2009 WDFW Forecast (CY 1) Recruits					11,423

Note: The WDFW used the same forecasting method. Therefore any differences in results are likely due to differences in source reconstruction estimates.

A-3. Summer Chum Salmon

A-3.1 Natural Runs (Tribal)

The 2009 return of summer-timed chum to the Discovery, Chimacum and Sequim Management Units was forecasted as a 4 year mean (2005-2008) of the total recruitment, for the Discovery and Sequim MUs, to all fisheries and escapement, and the 2004-05 and 2007-08 for the Chimacum MU (Table A-3-a). The forecasts are 4,004 fish to the Discovery MU, 943 fish to Sequim MU and 1,053 to the Chimacum MU. The forecasts excluded the 2006 returns to the Chjmacum MU as a statistical outlier. Recruits to the Dungeness / Graywolf system are few and unquantifiable at this time.

A-3.2 Natural Runs (WDFW)

For two management units (Discovery and Chimacum), the returns of summer chum were forecast in terms of natural origin fish because after the termination of several supplementation projects, few supplementation-origin adults are expected to return to these MUs in 2009.

Supplementation and reintroduction projects were implemented in Salmon Creek from 1992 through 2003 (Discovery MU); in Chimacum Creek from 1996 through 2003 (Chimacum MU), and in Jimmycomelately Creek from 1999 through the present (Sequim MU). 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 significantly to the summer chum adult recruitment and escapements.

The projects in Salmon Creek and in Chimacum Creek were terminated, following the release from the 2003 brood and no SORs are expected from those projects in 2009. Estimates of the number of natural-origin recruits (NORs) and supplementation-origin recruits (SORs) returning to each MU each year from 1999 through 2008 and forecasts for 2009 are shown in Table A-3-b.

Individual returns to the Discovery MU and the Chimacum MU were forecast as the mean of NOR recruits from the 2005 through 2008 return years; the resulting forecasts are 3,252 and 1,003 summer chum, respectively. The return to the Sequim MU was forecast as the mean of total (NOR + SOR) recruits from the 2005 through 2008 return years. The forecast is 943 summer chum. The total forecast for the Strait of Juan de Fuca is 5,198 summer chum (Table A-3-b). Summer chum escapements to the Dungeness River have ranged from 0 to 3 fish during the period from 2005 through 2008, therefore no forecast was made for 2009.

A-3.3 Natural Runs (Joint Approach)

The Summer Chum Salmon Conservation Initiative (SCSCI) defines Critical and Recovery abundance thresholds for each MU. The abundance thresholds are 220 (Critical) and 520 (Recovery) for the Sequim MU, 790 (Critical) and 1,560 (Recovery) for the Discovery MU. For the Chimacum MU, where summer chum were extinct and have been recently reintroduced, corresponding thresholds have not yet been established. The 2009 forecasted abundance for the returns of summer chum, under the Co-Managers' different forecasting approaches provide a range from 3,252 to 4,004 recruits for the Discovery MU, an estimate of 943 recruits for the Sequim MU, and a range from 1,003 to 1,053 recruits for the Chimacum MU. All estimates exceed the Critical threshold (where available) and exceed the Recovery threshold for the Discovery and Sequim MUs. The Co-Managers will use these ranges to conduct annual post-season abundance assessments comparing the forecasts to actual returns for each MU, as required by the SCSCI.

Table A-3-a. Summer Chum Salmon Recruits to Fisheries and Escapement

Year	Discovery	Sequim	Chimacum	Eastern Strait Total
1974	1,494	492		1,986
1975	1,374	373		1,747
1976	1,264	409		1,673
1977	1,364	446		1,810
1978	2,413	828		3,241
1979	699	201		900
1980	4,127	1,447		5,574
1981	879	261		1,140
1982	2,771	771		3,542
1983	946	272		1,218
1984	1,311	397		1,708
1985	304	108		412
1986	890	327		1,217
1987	1,673	508		2,181
1988	2,952	1,177		4,129
1989	441	355		796
1990	432	98		530
1991	253	172		425
1992	592	802		1,394
1993	520	124		644
1994	196	18		214
1995	647	234		881
1996	1,075	31		1,106
1997	923	62		985
1998	1,206	101		1,307
1999	532	7	38	577
2000	879	55	52	986
2001	2,811	262	909	3,982
2002	6,072	42	867	6,981
2003	6,004	450	563	7,017
2004	6,430	1,665	1,141	9,236
2005	7,012	1,317	1,404	9,733
2006	5,516	728	2,035	8,279
2007	1,726	659	933	3,318
2008*	1,760	1,066	735	3,561
2009 Tribal Forecast:	4,004	943	1,053	5,999

*The 2008 estimate is preliminary and subject to revision

Table A-3-b. Strait of Juan de Fuca Summer Chum Salmon Natural and Supplementation Origin Recruits.

Year	Discovery		Sequim		Chimacum	
	NOR	SOR	NOR	SOR	NOR	SOR
1999	141	391	7	0	0	38
2000	460	419	55	0	0	52
2001	1,230	1,581	253	9	0	909
2002	4,100	1,972	2	40	129	738
2003	4,021	1,983	69	381	229	334
2004	4,402	2,028	614	1,051	593	548
2005	4,656	2,356	496	821	894	510
2006	4,909	605	346	382	1,480	554
2007	1,684	42	659		903	30
2008	1,760	0	1,066		735	0
2009 WDFW NOR Forecast	3,252				1,003	
2009 WDFW NOR + SOR Forecast			943			
2009 WDFW Total Strait of Juan de Fuca Forecast					5,198	

A-4. Coho Salmon

A-4.1 Natural Runs

The method used to develop the 2009 forecasted return of naturally reared coho salmon, for primary units, relied on an estimate of emigrating smolts (2008 emigration), multiplied by an estimate of marine survival.

A-4.1.1 Naturally reared smolts

For primary units in the western Strait of Juan de Fuca, 46,110 smolts, representing production from five streams, which account for 19.03% of the coho rearing habitat, were expanded to 242,251 to represent the entire subregion (Table A-4-a). For primary units in the Eastern SJF the number of smolts from three production units, comprising 25.83% of the total, excluding Snow Creek, was measured and expanded to 28,673 wild smolts for the sub-region (Table A-4-a). To those, we added 16,916 smolts from the Snow Creek supplemented natural emigration, bringing the sub-region total to 45,589 smolts (Table A-4-a). The total number of estimated smolts, produced from all primary units, is estimated at 287,839 (Table A-4-a).

The number of emigrating smolts from secondary units (Elwha River and Dungeness River) was estimated, by extrapolation, using the ratio of the natural escapement of the Elwha and Dungeness River to that of all primary units in the parent brood year (2006) (Table A-4-f)

A-4.1.2 Marine Survival

Given the lag effect inherent in methods which use recent years' average survival, and the recent fluctuations in survival, we estimated marine survival from two regression models. The final estimate used the mean of the two results obtained by these models.

The first model, using the jack return rate from the Lower Elwha hatchery, predicted a marine survival rate to January age-3 recruits (JA3), of 0.0491 (Table A-4-d). The second model used the May-June mean Pacific Decadal Oscillation Index (PDO) to predict a marine survival rate to JA3, of 0.14045. While the results of these two models vary widely, each model has some very important merits, as well as shortcomings, that we considered carefully when developing this year's forecast.

The jack return model is commonly used to forecast the survival rate of various coho populations in Washington. It is based on the premise that much of the success of a brood year is determined by the growth rate and survival in the early months at sea, and that these are reflected in the number of jacks returning from their first year at sea. There is a significant linear relationship between the Elwha Hatchery jack return rate and the SJF natural coho marine survival ($p = 0.0287$, r-sq = 0.58). The jack return to the Elwha Hatchery was very low in 2008, and the resulting estimate of marine survival rate of 0.491 percent predicted by this model results in an estimate of 14,134 JA3 recruits.

The PDO model is based on a measure of sea surface temperature patterns across the Pacific Ocean. Lower sea surface temperatures are associated with higher survival of rates SJF wild coho, during their first year at sea. Several seasonal time periods of the PDO were analyzed; the best model fit came from the average of the May-June PDO index, which had a significant linear relationship with SJF natural coho marine survival ($p = 0.0175$, r-sq = 0.64). The PDO was especially negative (i.e., lower temperatures) during the May-June period of 2008. This model predicted a marine survival rate of 0.14045, which would then predict a return of 40,427 JA3 recruits. This level of return would be a record return in the available data series.

The final marine survival value used is the mean of the values produced by these models, which results in an estimate of 27,281 JA3 recruits (Table A-4-d). These were further apportioned into the Eastern and Western SJF subregions (4,321 and 22,961 respectively) on the basis of their relative smolt production from brood year 2006 (Table A-4-e).

Table A-4-a. SJF Coho Smolt Production in Small Streams

2008 Smolt Trapping	Enumerated Smolts	Enumerated Proportion of Total Potential	Estimated Total Smolts
Snow Creek. (Suppl. Nat.)	16,916		16,916
Jimmycomelately Creek	1,846		
Siebert Creek	3,172		
McDonald Creek	2,387		
East Total w/o Snow	7,405	0.25826	28,673
Salt Creek	16,309		
E. Twin River	4,932		
W. Twin River	4,417		
Deep Creek	18,376		
Johnson Creek.	2,076		
West Total	46,110	0.19034	242,251
E+W+Snow Total	70,431		287,840

Table A-4-c. Natural Escapement, Smolt Production, Elwha hatchery Jack Returns, and Pacific Decadal Oscillation (PDO) Index Factors, Relating to Marine Survival

Brood Year	Escapement	Smolts	Run Year	Elwha H. Jacks (RY-1)	May-June PDO Index (RY-1)	JA3 Recruits	Marine Survival
1996	8,042	139,683	1999	943	0.55	10,085	0.07220
1997	9,533	202,431	2000	1,861	-0.98	24,511	0.12108
1998	15,550	383,322	2001	950	-0.24	42,299	0.11035
1999	7,145	328,571	2002	910	-0.38	28,255	0.08599
2000	17,547	264,724	2003	431	-0.49	28,272	0.10680
2001	29,048	287,687	2004	527	0.79	19,389	0.06740
2002	20,117	228,996	2005	680	0.47	15,877	0.06933
2003	17,042	306,419	2006	158	1.52	6,075	0.01983
2004	12,003	402,005	2007	119	0.76	11,379	0.02830
2005	10,203	390,561	2008	37	-0.01		
2006	3,802	287,839	2009	85	-1.36		
2007	7,587						

Table A-4-d. 2009 Forecast of Natural Coho JA3 Recruits and Restrospective Results of the Methods Used to Estimate marine Survival

Run Year	Marine Survival	
	Jack Index Forecast	PDO Index Forecast
1999	0.07289	0.06077
2000	0.13179	0.12745
2001	0.07753	0.09175
2002	0.09653	0.10357
2003	0.05079	0.10432
2004	0.06157	0.04928
2005	0.07134	0.06503
2006	0.07443	0.02483
2007	0.05537	0.05885
2009 Est.	0.04910	0.14045
	2009 Forecast	
Marine Survival		0.09478
JA3 Recruits		27,281

Table A-4-e. Primary Natural Management Units Summary

Primary Management Units	Measured Wild Smolts	Proportion of Total Potential Measured	Estimated Total Smolts w Snow	JA3's Using Marine Survival
East Strait	7,405	0.25826	45,589	4,321
West Strait	46,110	0.19034	242,251	22,961
SJF Summary	53,515		287,839	27,282

Table A-4-f. Secondary Management Units Summary

Secondary Management Units	2006 Natural Escapement	2006 Brood Secondary Escapement Proportion	Estimated Smolts*	Estimated DA2's
Elwha	38	0.264	2,877	273
Dungeness	106	0.736	8,025	761
Total Secondary	144	1.000	10,902	1,034

A-4.2 Hatchery Runs

The 2009 returns of Strait of Juan de Fuca hatchery coho were predicted using the estimated 2005-07 (3 years - 1 brood cycle) average smolt survival to December age-2 recruits (DA2) recruits, applied to the 2008 smolt releases (Table A-4-f). More specifically, the following sources of information were selected:

Dungeness Hatchery: 2005-2007 average recruits per smolt (0.01291) (Table A-4-e). Given a release of 536,300 smolts, the 2009 forecast is 6,925 DA2 recruits.

Elwha Hatchery: 2005-2007 average recruits per smolt (0.00582) (Table A-4-e). Given a release of 323,745 smolts, the 2009 forecast is 1,885 DA2 recruits.

The total hatchery-origin preseason forecast value of 8,810 DA2 recruits (8,141 Jan Age 3) will be used for simulation modeling and preseason planning.

Table A-4-g. Strait of Juan de Fuca Hatchery Coho Contribution to Puget Sound Net Fisheries and Escapements (Next Page)

Run Year	Dungeness Hatchery			Elwha Hatchery		
	Smolts Released	DA 2 Recruits	R/Sm	Smolts Released	DA 2 Recruits	R/Sm
1979	796,100			1,387,900		
1980	399,200			837,900		
1981	679,700			1,168,700		
1982	929,400			2,845,100		
1983	106,590			2,756,200		
1984				567,800		
1985	188,000			751,000		
1986	298,000			645,400		
1987	320,000			836,000		
1988	748,600	*20,948*	*0.02798*	728,500	5,260	0.00722
1989	301,700	25,401	0.08419	240,700	15,017	0.06239
1990	359,050	*20,811*	*0.05796*	413,500	12,320	0.02979
1991	342,700	*12,102*	*0.03531*	768,600	3,522	0.00458
1992	296,400	14,058	0.04743	688,600	9,848	0.01430
1993	433,700	*9,789*	*0.02257*	755,600	4,913	0.00650
1994	340,000	8,923	0.02624	580,000	2,504	0.00432
1995	680,000	26,830	0.03946	707,700	10,250	0.01448
1996	808,700	29,804	0.03685	801,000	13,705	0.01711
1997	871,600	16,596	0.01904	722,200	11,988	0.01660
1998	774,600	12,301	0.01588	643,037	6569	0.01022
1999	877,300	6,073	0.00692	867,379	9,438	0.01088
2000	788,600	42,393	0.05376	645,856	4,962	0.00768
2001	865,700	52,851	0.06105	684,856	15,237	0.02225
2002	550,700	17,588	0.03194	494,610	12,419	0.02511
2003	565,300	26,894	0.04757	662,231	3,461	0.00523
2004	505,750	9,486	0.01876	724,594	8,713	0.01202
2005	509,300	7,821	0.01536	661,700	7,788	0.01177
2006	512,450	2,141	0.00418	175,380	642	0.00366
2007	500,000	9,603	0.01921	643,122	1,309	0.00204
2008	514,100			411,745		
2009	536,300			323,745		
Average(2004-06):			0.01291	**Average (2004-06):**		0.00582
2009 Forecast DA2's			6,925			1,885

Table A-4-h. Coho Salmon Spawning Escapements to Primary Natural Spawning Areas of the Strait of Juan de Fuca

Year	E. Strait	W. Strait	Total
1986	3,909	9,346	13,255
1987	1,769	7,600	9,369
1988	2,530	6,070	8,600
1989	3,074	9,802	12,876
1990	1,139	7,078	8,217
1991	2,381	6,662	9,043
1992	1,157	9,339	10,496
1993	776	7,594	8,370
1994	1,139	5,911	7,050
1995	1,572	10,914	12,486
1996	1,086	6,956	8,042
1997	1,551	7,982	9,533
1998	1,313	14,237	15,550
1999	1,314	5,831	7,145
2000	2,180	15,367	17,547
2001	2,539	26,509	29,048
2002	3,002	17,115	20,117
2003	3,249	13,793	17,042
2004	7,752	12,003	19,755
2005	3,426	6,777	10,203
2006	1,812	1,990	3,802
2007	3,171	4,416	7,587

Note: Escapement estimation methods changed in 1998. Estimates for earlier years were developed using relationships between index redd measurements and the results obtained from the current methods for escapement assessment.

A-5. Fall Chum Salmon

A-5.1 Natural Fall Chum Salmon Forecast (Tribal)

The 2009 return of fall-timed chum salmon to the Strait of Juan de Fuca tributaries was forecasted, in the aggregate, as the average of the natural and off-station runs observed in the years 2003 through 2007 (Table A-5-a). The resulting forecast of **1,823** was apportioned 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%). At the time the forecast was prepared, more recent run size estimates, including 2008, were not available. (Table A-5-d).

A-5.2 Natural Fall Chum Salmon Forecast (WDFW)

The 2009 return of natural fall-timed chum salmon to Strait of Juan de Fuca streams was preliminarily derived as a portion of the forecasted return of all Puget Sound natural fall-timed chum. Natural fall chum forecasts were calculated using the Puget Sound-wide recruit/spawner (R/S) method, with the regional (Strait of Juan de Fuca) forecast and terminal within region forecasts, estimated by apportioning the total according to parent escapements.

The Puget Sound forecast was initially forecast using parent brood escapements, long-term odd/even-year specific average R/S values, and long-term odd/even-year specific mean proportions returning at age for 3, 4, and 5-year old returns. For example, the 2009 three-year old forecast was derived by multiplying the 2006 natural escapement by the mean even-year brood R/S value to get a total return of 2006 brood offspring. This number was then multiplied by the mean proportion of the return at age 3 for even-year broods, yielding the 2009 age 3 return forecast. This was repeated for 4 and 5-year old components, and all three were summed to obtain a total Puget Sound forecast.
Puget Sound natural fall chum parent escapements were large during 2004 and 2006. The 2004 parent escapement (872,280) was the third largest escapement on record, and the 2006 parent escapement (792,613) was quite strong. Without some adjustment to the traditional R/S method, the 2009 forecasts would likely be over-estimates. For example, the actual return of natural-origin chum in Hood Canal and South Sound in 2006, 2007 and 2008 were about three-fourths of the predicted run size, using the traditional R/S method. To address this, we used 75% of the long-term R/S averages for the 2009 forecasts. This kept the prediction inside the bounds of the existing data and compensated for the uncertainty resulting from record escapements and apparent lower survival. This method forecast returns of 724,533 natural fall chum to Puget Sound (Table A-5-b).

The forecasted return of each age group to Puget Sound was then apportioned to the Strait of Juan de Fuca using the proportions of the parent escapement of each brood. The forecast for Strait of Juan de Fuca is 3,351 natural fall chum salmon (Table A-5-c). The forecasts for individual production units are shown in Table A-5-d.

A-5.3 Preliminary Preseason Forecast

Given the numerically small difference in the results obtained by the two methods, we have agreed to use the average of the two results, for preseason planning purposes. (Table A-5-d)

Table A-5-a. Strait of Juan de Fuca Historical Fall Chum Salmon "4B" Runs

Return Year	Fall Chum Run Size	Return Year	Fall Chum Run Size
1980	5,862	1994	2,564
1981	6,518	1995	610
1982	6,744	1996	2,162
1983	1,765	1997	3,927
1984	8,280	1998	1,535
1985	8,330	1999	1,313
1986	1,922	2000	269
1987	7,269	2001	1,737
1988	**13,962**	2002	5,198
1989	4,331	2003	1,177
1990	1,220	2004	3,232
1991	1,941	2005	2,382
1992	5,654	2006	1,567
1993	5,775	2007	757
Average (All Yrs.):			3,483
2009 Tribal Forecast (Average 2003-07):			**1,823**
Std. Dev. (03-07):			885

Table A-5-b. 2009 WDFW Puget Sound Natural Fall Chum Salmon Forecast

Parent Brood	Age	Parent Escapement	Mean R/S1	Adjusted R/S (.75)	Estimated R/S (all ages)	Mean Age Composition1	Natural Forecast
2004	5	872,280	2.51451	1.88588	1,645,016	0.04752	78,176
2005	4	286,719	3.13153	2.34865	673,402	0.56089	377,706
2006	3	792,613	2.51451	1.88588	1,494,773	0.17973	268,651
						Total	724,532

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

Table A-5-c. 2009 WDFW Strait of Juan de Fuca Natural Fall Chum Salmon Forecasts

	Puget Sound Forecast	SJF Parent Escapement Proportion	SJF Forecast by Age
Age 3 (2006 Brood) Forecast	268,651	0.00160	431
Age 4 (2005 Brood) Forecast	377,706	0.00709	2,677
Age 5 (2004 Brood) Forecast	78,176	0.00311	243
Total WDFW Forecast	724,533		**3,351**

Table A-5-d. Apportionment of the Strait of Juan de Fuca Natural Fall Chum Salmon Forecast

Area	Proportion	Tribal Forecast	WDFW Forecast	Average of Forecasts
Pysht R	0.458	836	1,536	1,186
Dungeness R	0.139	253	465	359
Deep Creek	0.139	253	465	359
Miscellaneous	0.264	481	884	683
Total		1,823	3,351	2,587

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

Using Data through Oct. 8	
P ($\beta 1=0$)	0.0056
R2	0.747
Sqr.Root MSE	7683.3
N	8
$\beta 0$	623.677
$\beta 1$	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