

**2003 MANAGEMENT FRAMEWORK PLAN
AND
SALMON RUNS' STATUS
FOR THE
HOOD CANAL REGION**

Joint Report

by:

Point No Point Treaty Council

(for the Port Gamble, Lower Elwha and Jamestown S'Klallam Tribes)

Washington Department of Fish and Wildlife

Skokomish Tribe

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1. Introduction

1.1 General

This report has been prepared by the Point No Point Treaty Council (for the Lower Elwha, Port Gamble, and Jamestown S'Klallams) and was reviewed and agreed to, by the Skokomish Tribe and the Washington Department of Fish and Wildlife (WDFW). Any differences between the parties are noted. This report is intended to fulfill the parties' reporting requirements under the provisions of Section 5.2 of the Puget Sound Salmon Management Plan, facilitate the management of the 2003 runs of Hood Canal-origin salmon in that region, as well as document the methodologies used. This report covers all species of salmon (except steelhead) for the Hood Canal Region. The regional "Management Framework" section of this report (Section 4.0) documents the parties' pre-season framework management understandings for this region.

Forecasted returns of each species, except fall chum salmon, are based on the total anticipated recruits and all intercepting fisheries. For fall chum salmon, forecasts include all salmon available for net fisheries and escapement, and exclude non-landed mortalities, troll, recreational, ceremonial and subsistence harvests not taken in net fisheries. All forecasts are outlined in this report by management unit. Agreed-upon escapement goals, expected escapements (those that would result under the parties' management framework) for each management unit (natural and hatchery, primary and secondary), expected harvests, test and evaluation fishery requirements, and pre-season as well as in-season run assessment methods are included. Detailed information, concerning the methods used to forecast the abundance of each run, is presented in Appendix A. Information concerning methods used to obtain inseason estimates of abundance is presented in Appendix B.

The parties' pre-season management framework outlines the anticipated measures to be taken in Puget Sound commercial and recreational fisheries for the harvest and protection of salmon runs returning to Hood Canal. The framework also includes any contingency measures contemplated by the parties for use in-season, should the need arise.

1.2 Summary of the 2003 Runs and Fisheries

Of the runs returning to Hood Canal, the early fall chum runs and south Hood Canal chinook will be managed on the basis of hatchery production. Additionally, coho salmon of the Port Gamble and Quilcene-Dabob management units will also be managed on the basis of hatchery production. The remaining management units of all species will be managed on the basis of natural production. These include (in accordance with the Hood Canal Salmon Management Plan) all of the remaining coho management units; all summer chum salmon (managed as secondary to chinook and coho salmon), and all late fall chum salmon. Additionally, since 2000, management strategies have been adopted to reduce impact upon listed (50 CFR Parts 223 and 224) evolutionarily significant units (ESU's) of fish which include Hood Canal/Strait of Juan de Fuca (HC-SJF) summer chum salmon and Puget Sound chinook salmon.

Summer/Fall chinook returning to hatcheries and natural spawning areas in area 12C and the Skokomish River are predicted to return at harvestable levels to be managed inseason. Chinook salmon returning to Area 12B tributaries are expected to be of extremely low abundance and require long term protective measures.

A limited Treaty Indian fishery, as well as recreational fisheries, for chinook salmon are anticipated in Areas 12C and in Area 12H where Hoodspout hatchery returns will provide for additional directed harvest.

Summer chum salmon are of very low abundance throughout this region and will provide no harvestable surplus in the Hood Canal “mainstem”. In the Quilcene-Dabob area, appropriate fishing restrictions will be in place, as described in the *Summer Chum Salmon Conservation Initiative* (SCSCI) to ensure that the broodstock requirements for the Quilcene National Fish Hatchery (QNFH) supplementation program are met.

Of the various other runs of salmon, coho returning to the Quilcene Bay Pens and the Quilcene National Fish Hatchery (QNFH), coho returning to Port Gamble pens, and fall chum returning to all Hood Canal hatchery facilities, as well as those returning to natural spawning areas, are expected to be of sufficient abundance to support significant directed commercial and recreational fisheries. Naturally reared coho salmon, from all other management units, are expected to also be of sufficient abundance to provide for significant levels of directed harvest (as well as incidental harvests) in the Hood Canal “mainstem” fishery and in the Skokomish River.

Pre-season forecasts of abundance (Tables 3.1 - 3.5) are provided as a pre-season estimate of harvest and guide for conservation planning. The actual run sizes may deviate from the forecasts because of statistical variability, unusual rates of survival (high or low), or unanticipated changes in exploitation rates in prior fisheries. Methods used to derive the pre-season forecasts for 2003 are detailed in Appendix A of this report. In most cases, the escapement goals indicate the currently accepted estimate of escapement abundance necessary to provide for future maximum sustainable harvest (MSH), under average progeny survival conditions. However, in the case of summer chum salmon, the goals are based on the targets established in SCSCI. In the case of chinook salmon, the targets are those established in the *Puget Sound Comprehensive Chinook Management Plan* (PSCCMP). In the case of coho salmon returning to natural spawning areas, the escapement goal is that which would result from the rate of escapement allowance established for the 2003 recruits. The escapement rate was established at a level equal to, or higher than, the minimum escapement rate allowable for the 2003 forecasted recruitment (55%), under the stepped exploitation rate management approach, which has been implemented for Hood Canal natural (primary) coho. Expected escapements are those that would result from the stated forecasts after fisheries consistent with the parties' pre-season planned management framework.

2. 2003 Fishery Management Periods

Area	Spring Chinook	Summer Chinook	Pink	Summer Chum	Coho	Early Fall Chum	Late Fall Chum	Winter Steelhead
9A	---	---		---	8/31-11/01	11/02-11/29	---	11/30-3/31
12A	---	---		8/30-09/27	8/30-10/18	10/19---	----12/27	---
12	4/16-7/12	7/13-9/05	7/27-9/27	9/01-9/22	9/10-10/18	10/19-11/20	---	---
12B	4/16-7/12	7/13-9/13	7/27-9/27	9/05-10/01	9/13-10/25	10/26-11/20	---	---
12C	4/16-7/19	7/20-9/18	7/27-9/13	8/26-10/01	9/18-10/25	10/26-11/27	---	---
12D	4/16-7/19	7/20-9/18		8/29-9/22	9/18-10/25	10/26-11/27	---	---
Quilcene R	---	---		9/05-10/13	9/01-10/18	11/12---	—01/09	12/07-4/15
Dosewallips Duckabush	---	8/10-9/20	9/14-10/18	9/07-10/12	9/21-11/15	11/16---	—12/28	12/07-4/15
Skokomish R	5/01-8/02	8/03-9/20		---	9/21-11/15	11/16---	---12/28	12/07-4/15
Union R.	---	---		9/02-10/06	9/21-11/15	11/16---	---12/28	12/07-4/15
Misc. HC Tribs.	—	8/10-9/20	9/14-10/18	---	9/21-11/15	11/16---	---12/28	12/07-4/15

Note: Shaded areas represent cases where the management periods have not been adjusted to eliminate overlaps/gaps.

The management periods defined above describe, for each area, 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 of that species (actual and/or expected), outside its management period. Since many runs extend over lengthy periods of time, with small portions of the runs available at the extreme ends of the annual entry pattern, it is impractical to attempt to take management actions directed at these runs throughout their entire entry while continuing to simultaneously manage fisheries on other species and runs. 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 Hood Canal "Early-fall" chum management periods cover the central 80% of the Hoodspport Hatchery run timing for all marine areas except Areas 9A and 12A, which are based on the actual Area 9A and 12A hatchery stock timing. "Late-fall" chum management periods begin after the central 80% of the Hoodspport hatchery run has returned. Late-fall ending dates (generic) are based on adult tagging (or, in the case of QNFH, rack counts), but in practice are often adjusted to eliminate overlaps and gaps with winter steelhead management periods.

For 2003, the above management periods have been derived (unless otherwise noted) by the following steps: first the central 80% (average) of the entry pattern for each species, for each area where that species is found, 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 all affected parties. Next, "overlaps" and "gaps" between the periods were generally eliminated, generally by halving. Finally, the resulting "start" and "end" dates for each period were adjusted to begin on the nearest Sunday and end on Saturday, in order to facilitate weekly fisheries management. These last procedures, were not followed in the case of summer chum salmon, because to do so, might result in inadequate protection for these diminished runs. Management periods should not be viewed as inflexible

and may be adjusted in-season by agreement of the parties, on the basis of in-season information indicating a shift in run timing for a particular population.

3. Summary of Pre-Season Forecasts, Expected Harvests and Escapements

3.1 Summer/Fall Chinook Salmon

Fishery	Management / Production Units					Total
	Skokomish		Mid-Canal	Miscell.	Hoodspport	
	Natural	Hatchery	Natural	Natural	Hatchery	
Recruits	3,272	15,895	728	816	24,866	45,577
Canada	425	2,072	95	106	3,195	5,893
Alaska	0	0	0	0	0	0
S.Falcon Tr/Rec	1	4	0	0	6	11
N.Falcon Tr/Rec	142	690	32	35	1,065	1,964
P.S. Troll	4	22	1	1	34	62
SJF Rec.	22	108	5	6	167	308
Puget Sound Rec.	191	931	43	48	1,435	2,648
Puget Sound Net	44	214	10	11	330	609
Hood Canal Rec.	20	46	3	5	426	500
Hood Canal Net	49	237	2	12	366	666
Freshwater Rec.	451	2,196	1	1	0	2,649
Extreme Terminal Net	537	2,617	0	0	12,248	15,402
Mgt Unit Harvest	1,886	9,137	192	225	19,272	30,712
Mgmt Unit Escap..	1,386	6,758	536	591	5,594	14,865
Escapement Goal	1,650	2,000	750	n/a	1,800	6,200

In March 1999, Puget Sound chinook were listed as threatened by the NMFS (50 CFR part 223 and 224). Chinook runs in Hood Canal, included in the Puget Sound ESU, have been at fairly low levels over the last decade. Given the relatively low expected returns, of naturally reared Hood Canal chinook salmon, in 2003, fisheries directed at chinook salmon will be significantly curtailed in Hood Canal areas.

The above table was prepared using the results of the final PFMC simulation model run *FRAM #1603AEQfix* which incorporates the forecast information and takes into account all anticipated preterminal and terminal area harvest impacts. The harvest figures shown above include all Puget Sound harvests (commercial net, troll, marine and freshwater recreational). For further details on the methods used to estimate the above forecasts, see Appendix A-1. Escapement targets for natural spawning areas are based on the Order Re: *Hood Canal Salmon Management Plan (Proc. 83-8)* as well as pre-season interagency agreements and are listed here primarily for reference purposes, since the pre-season planning was primarily based on total exploitation rate limitations. The escapement goals listed for the Hoodspport and George Adams/McKernan (Skokomish R.) hatcheries are those necessary to provide the required

enhanced production in accordance with the parties' 1998 enhancement planning proposed modifications to the Hood Canal Production Evaluation Program.

3.2 Pink Salmon

Production Unit	Total Recruits	Canada Pre-Terminal Harvest	Washington Pre-Terminal Harvest	Terminal Area Harvest	Expected Escapement	Escapement Goal
Dosewallips	41,255	5,339	1,335	0	34,581	N/A
Duckabush	57,677	7,464	1,866	0	48,347	N/A
Hamma Hamma	98,574	12,757	3,189	0	82,628	N/A
Misc.	157	20	5	0	132	N/A
Hoodsport H.	7,330	949	237	5,044	1,100	1,100
Totals	204,994	26,529	6,632	5,044	166,789	

The pink salmon runs to Hood Canal consist primarily of natural reared recruits of the Dosewallips River, the Duckabush River, the Hamma Hamma River, and miscellaneous small tributaries to Area 12C. The natural stock forecast was apportioned to individual rivers using brood year 2001 escapement distribution. Anticipated prior harvests were estimated using the mean interception in the 1993-2001 period (current PST period). Methods used to forecast the 2003 runs, originating from these areas, are detailed in Appendix A-2.

The optimum level of spawning escapement for the primary natural units is currently unresolved (See: HCSMP). The Hoodsport Hatchery escapement goal has been established at the level required to maintain the current brood stock. However, because of the unit's secondary status, and the need to protect commingled chinook salmon in prior fisheries, excess escapement is highly probable and will be used in accordance with jointly established procedures and priorities. Anticipated surplus above the escapement goal of pink salmon returning to Hoodsport Hatchery may be sufficient to support fisheries in Area 12H, in the vicinity of the station.

3.3 Summer Chum Salmon

Management Unit	Total Recruits	Canadian Harvest	Washington Preterminal Harvest	Terminal Harvest	Extreme Terminal Harvest	Expected Escapement	Minimum Escapement Threshold
Quilcene/Dabob	5,974	377	149	125	257	5,066	1,110
Mainstem HC	3,320	210	83	70	0	2,958	2,660
SE Hood Canal	834	53	21	32	0	729	300
Totals	10,128	639	252	227	257	8,753	4,070

Note: The Area 12A forecast includes the combined return of naturally reared and QNFH supplementation program summer chum.

Hood Canal summer chum salmon originate from natural production in streams tributary to the mainstem Hood Canal, Quilcene/Dabob, and SE Hood Canal. The methods used to develop the 2003 forecasts of summer chum salmon are described in Appendix A-3 of this report.

In March 1999, the Hood Canal-Strait of Juan de Fuca ESU (Evolutionary Significant Unit) summer-run chum salmon was listed as threatened by NMFS (50 CFR part 224). Hood Canal summer chum salmon are managed as secondary management units, in accordance with the Puget Sound and Hood Canal Salmon Management plans. In 2003, anticipated interceptions may occur during marine area fisheries for chinook and coho salmon in Hood Canal. There may also be some potential for incidental catch in Washington pre-terminal area fisheries for sockeye and pink salmon. Although these units are managed as secondary, additional measures are taken to ensure that their recovery is not impeded by harvest impacts.

In 2003, the mean expected exploitation rate based interception, derived from *the Base Conservation Regime* (BCR) management, was used to assess interception of total recruits entering terminal areas. Because of additional measures taken in various fisheries, it is expected that lower rates than those predicted will result. Minimum escapement thresholds are based on the BCR. The U.S. Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW), and Tribes will cooperate in collecting (from the Area 12A fishery and the Quilcene freshwater areas) all usable, up to 230 pairs (if available), summer chum salmon for the purpose of natural run supplementation from the Quilcene National Fish Hatchery and the Big Beef Creek experimental reintroduction program.

3.4 Coho Salmon

The normal-timed coho salmon runs returning to Hood Canal consist of several small natural components in all river systems, in addition to hatchery components returning to the George Adams Hatchery in the Skokomish river system and the Quilcene National Fish Hatchery in the Big Quilcene river system. Other normal-timed units include delayed-release coho from the sea pen facilities at Quilcene Bay and Port Gamble Bay. The Quilcene Hatchery run is timed somewhat earlier than the other normal-timed runs.

Management / Production Units								
Fishery	12/12B/12C/12D Skokomish		9A ⁽¹⁾	12A ⁽¹⁾	Hood Canal Stocks' Subtotals		Non Local	Total
	Natural	Hatchery	Aggregate	Aggregate	Hatchery & SecNat'l	Primary Natural		
Recruits	32,602	18,452	8,438	21,854	48,744	32,602		81,346
Canada	160	354	117	217	688	160		848
S.Falcon Tr/Rec	45	65	26	55	146	45		191
N.Falcon Tr/Rec	1,906	2,255	1,351	2,538	6,144	1,906		8,050
P.S. Troll	26	14	9	15	38	26		64
Strait Rec.	828	1,972	1,179	1,872	5,023	828		5,851
SJI Rec.	0	7	21	23	51	0		51
Area 9 Rec.	956	617	254	723	1,594	956		2,550
S. Sound Rec.	393	277	135	399	811	393		1,204
Strait Net	608	406	177	429	1,012	608		1,620
SJI Net	26	17	8	21	46	26		72
No. Sound Net	47	35	11	33	79	47		126
So. Sound Net	739	435	198	511	1,144	739		1,883
Hood Canal Rec.	971	443	160	498	1,101	971	87	2,159
HC Rivers Rec.	559	603	0	5,803	6,406	559		6,965
HC Mainstem Net	3,181	1,416	64	301	1,781	3,181	385	5,347
Area 9A Net ⁽¹⁾	2,127	596	2,424	659	3,679	2,127	1,840	7,646
Area 12A Net ⁽²⁾	202	68	0	6,441	6,509	202		6,711
Skokomish R Net	816	1,113	0	0	1,113	816		1,929
Mgt Unit Harvest	13,590	10,693	6,134	20,538	37,365	13,590	2,312	53,267
Mgt Unit Escap.	19,012	7,759	2,304	1,316	11,379	19,012		30,391
Min. Escap. Goal	17,931	550	473	2,086				

Notes: (1) These management units also contain naturally reared coho, which were estimated separately and then "aggregated" for modeling and management purposes, because of their secondary classification.

The aggregate (natural and hatchery) Hood Canal run of December Age-2 (DA-2) recruits was forecast to be 107,173, consisting of 44,571 natural (43,141 primary and 1,430 secondary) and 62,602 hatchery coho. For 2003, the PNPTC Tribes and the WDFW jointly agreed to use the mean of the results obtained from each agency's pre-season forecast. The mean of the resulting range was 44,571 DA-2 and this was used to provide model input values for the 2003 PFMC/North of Falcon management planning process. The methods used to develop the 2002 Point No Point Treaty Council (PNPTC) and Washington Department

of Fish and Wildlife (WDFW) Hood Canal coho forecasts are further detailed in Appendix A-4 of this report.

Table 3.4 is based on the results of the pre-season *FRAM* simulation run #0319, and does not include estimated natural mortality in 2003. The expected harvest numbers refer to the total anticipated landed and nonlanded harvests from both incidental and targeted fisheries, based on estimates provided by pre-season *FRAM* simulation run #0319. Further details concerning pre-season fishing plans are shown in Section 4 of this report.

The escapement goals for Hood Canal primary natural coho are based on a maximum allowable exploitation rate of 45% in all fisheries, based on this year's predicted abundance. The expected escapements are those which would result after the application of the pre-season established fishing regimes, to the 2003 forecasted abundance.

The escapement targets for hatchery (and secondary natural) management units are those necessary to meet the parties' agreed-upon enhanced production, as adjusted for 2003, in order to accommodate proposals to modify the brood origin of coho used in the Quilcene Bay and Port Gamble net pen programs.

3.5 *Fall Chum Salmon*

The Hood Canal run of fall chum salmon is generally forecast as a single fall run, composed of hatchery and natural management units. However, in accordance with the Hood Canal Salmon Management Plan, it is also separated into two timing components, which are also used for management purposes. "Early fall" chum refer to the Hoodspout Hatchery and other hatchery management units, using the same brood, as well as similarly timed natural units; "Late fall" chum refer to natural units returning after the Hoodspout run, as well as similarly timed hatchery units (Enetai and QNFH). In practice, during the early fall chum management period, only the Hoodspout/George Adams/McKernan units are considered primary. During the late-fall management period, natural units (Skokomish R., Area 12B, and Area 12A tributaries) become the primary units.

Methods used to estimate the 2003 forecasts of all fall chum salmon returning to Hood Canal are described in Appendix A-5 of this report. The pre-season summary, presented in Table 3.5, is the result of averaging the forecasting results obtained by PNPTC and WDFW, using alternate methods, for each production unit. This was made possible because of the similar overall abundances predicted by the various methods.

Pre-terminal catches are expected to occur primarily during Treaty Indian and non-treaty chum fisheries directed at mixtures of various Puget Sound and British Columbia runs. The portion of these catches that is expected to come from Hood Canal management units, has been estimated to be approximately 2,000 at the Strait of Juan de Fuca (SJF) and 3,570 at the San Juan Islands (SJI). This is assuming the pre-season forecasted catch level of 6,100 chum salmon in the SJF, and a catch limit of 160,000 in SJI. The methods used to obtain the SJF and SJI estimates utilized the 1986-1996 average of the Hood Canal contribution to management weeks' 40-46 catch in those fisheries, as shown by GSI sampling. The total anticipated volume of harvest in the above fisheries was estimated using the mean catch per day during the 1999-2002 period (for SJF), and provisions of Annex IV, Ch. 6 of the PST and State-Tribal agreements (for SJI), as well as pre-season forecasts of abundance of chum salmon returning to Puget Sound and the "inside" areas of British Columbia.

The proportion of the escapement to be taken at the Hoodspport Hatchery versus the George Adams/McKernan Hatchery complex, is based on the management objectives of meeting the combined Hoodspport/Skokomish River hatchery escapement, egg volume quarantine limitations at Hoodspport Hatchery, plus providing a minimal in-river harvest in the Skokomish River.

Management and Production Units	"4B" Run	Pre-Term Harvest	Terminal Run	Terminal Harvest	Extr. Term Harvest	Expected Escapement	Escapement Goal
<i>AREA 9A</i>							
Natural	0	0	0	0	0	0	0
Hatchery	2,988	49	2,939	2,498	397	44	0
<i>AREA 12</i>							
Natural	2,922	48	2,874	2,443	0	431	3,900
<i>AREA 12A</i>							
Natural	8,072	131	7,940	2,227	0	5,713	1,250
Hatchery	8,983	146	8,837	4,131	0	4,706	3,100
<i>AREA 12B</i>							
Natural-Augmented	36,816	599	36,216	10,164	0	26,052	18,750
<i>AREA 12C</i>							
Natural	19,487	317	19,169	16,294	0	2,875	7,000
Hoodspport Hatchery	141,382	2,302	139,080	118,218	8,362	12,500	12,500
Enetai Hatchery	3,642	59	3,583	1,949	0	1,634	1,900
<i>AREAS 82G/J (Skokomish R.)</i>							
Natural	11,595	189	11,406	5,817	222	5,367	9,800
G.Adams-McKernan Hatchery	86,419	1,407	85,012	72,260	2,752	10,000	10,000
<i>AREA 12D</i>							
Natural-Augmented	19,755	322	19,433	16,518	0	2,915	13,550
Totals	342,061	5,570	336,491	252,519	11,733	72,237	81,750

The expected escapement to the Little Boston Hatchery assumes a 90% extreme terminal harvest rate in Port Gamble Bay. Other expected escapements on fall timed runs are based on the application of harvest appropriate to fully harvest the Hoodspport-George Adams-McKernan surplus. For late-fall chum, the expected escapements are those that would result after Hoodspport-timed chum have been taken from the portion of each late-fall management unit that overlaps the Hoodspport entry timing.

Escapement goals for natural fall chum salmon were developed by WDFW. They are generally the average of the three largest even-year escapements in the years 1968-1977. For secondary management units, these goals form a management guideline for secondary management unit protection.

4. Pre-Season Management Framework

4.1 2003 Harvest Management Measures and Expected Fisheries

In 2003, the condition of the salmon runs returning to the Hood Canal terminal areas requires that harvest management plans be conservative.

Summer/Fall chinook salmon returning to Hood Canal should be managed in order to achieve the necessary escapements to the WDFW hatcheries which contribute the majority of the harvestable return to Hood Canal. The combined escapement target of 3,800 chinook salmon, to the various WDFW hatchery facilities, initially defines the aggregate allowable harvest rate in the terminal marine areas and the Skokomish River. However, in addition to that limitation, starting in 2000, additional management measures must be taken in response to the listing of Puget Sound chinook salmon as threatened, under the ESA. The Hood Canal chinook salmon return shall be managed to meet the needs of three major units: Mid-Canal (Dosewallips, Duckabush and Hamma Hamma), Skokomish (aggregate of naturally reared and hatchery mitigation), and the Hoodspout Hatchery. In order to provide necessary protection to the Mid-Canal unit, as well as provide both fishing opportunity and protection to Skokomish chinook salmon, chinook salmon fisheries will only be implemented in Area 12C and in the Hoodspout Hatchery zone (Area 12H). Skokomish River (Area 82G) fisheries will also be implemented. Fisheries in Area 12C will be further restricted in order to provide protection for commingled summer chum salmon.

Fisheries directed at Hood Canal hatchery and natural coho salmon will be scheduled in Hood Canal mainstem terminal areas. Provisions for conservative management of Hood Canal coho salmon stocks were pursued during the 2003 PFMC/North of Cape Falcon process, primarily to ensure that commingled summer-run chum and chinook salmon will be protected. The parties have agreed to implement the previously adopted summer chum salmon base conservation regime (BCR) management measures in 2003. The BCR is based on a series of management measures, which are expected to effectively reduce incidental impact to the summer chum salmon ESU. These measures include a combination of specific management actions and fishery specific exploitation rate “ceilings”. Given the limited data available for summer chum, this has been determined the best strategy for protection and recovery of the Hood Canal mainstem management unit.

In 2003, early-fall chum salmon runs managed at rates appropriate for the George Adams/McKernan, Hoodspout, and Little Boston hatcheries are expected to comprise most of the total fall chum salmon return. Therefore, significant harvests are expected during the early-fall chum salmon management period.

4.1.1 Commercial Fisheries

All commercial fishery openings, restrictions, and closures outlined, are those which were planned pre-season and evaluated as to their potential effect. During the season, as more information becomes available on the runs, habitat conditions, fishery impacts and requirements, the fishery schedules, closures, and other measures may be modified to provide for the necessary protection to escapements, as well as opportunity to harvest available surpluses.

In order to provide secondary protection for milling mature salmon, no Treaty marine nets will be permitted within 1,000 feet from the mouth of any stream which is not open to net fisheries. When non-treaty commercial fisheries are authorized, exclusion zones, per WAC 220-47-307, shall be utilized. These closures shall be in effect at all times throughout the 2003 fishing season.

4.1.1.1 Hood Canal Mainstem (Areas 12, 12B, 12C).

Per the *Hood Canal Salmon Management Plan*, no commercial net fisheries for salmon shall take place in Hood Canal marine areas throughout the spring chinook management period.

During the summer/fall chinook management period, and in accordance with Tribal-State pre-season planning, no fisheries will take place in Hood Canal Areas 12, 12B and 12D. However, a chinook-directed fishery in Area 12C will be implemented in 2003, from July 20 through August 24. Gillnets shall be restricted to 7" minimum mesh size after July 31. This fishery has been initially scheduled to operate up to 5 days per week. Additional fisheries may also be implemented in Area 12H, as necessary to harvest surpluses, from August 5 through September 25. This fishery shall be required to selectively release all chum salmon. In the Area 12H, hook-and-line gear may be operated continuously and beach seine gear may be operated during daylight hours, on Tuesdays and Thursdays. These pre-season measures may be modified on the basis of in-season information.

Harvest of pink salmon will be conducted along with chinook, in Areas 12C and 12H. No in-river harvest of pink salmon has been planned, in order to avoid interceptions of commingled, listed, chinook and summer chum salmon.

During the coho management period, in Area 12, gillnets may operate from September 25 through October 18. Beach seines may start no earlier than September 18 with release of chinook and chum through September 30. In Areas 12B, 12C, and 12D (west of Madrona Pt.) gillnet fisheries may start no earlier than October 1. While beach seines may be used up to a week earlier, they will be required to release chum salmon, and in Area 12B, chinook salmon through September 30.

Gillnet fisheries for coho salmon, in Area 12C, have been initially planned to operate up to 4 days/week through October 18, followed by up to 6 days per week, in the week of October 19 and up to 7 days per week thereafter. During coho salmon fisheries, the area within 500' from the western shore, to a point 2,000' south of Lilliwaup Creek (in addition to the stream-mouth closures indicated in Section 4.1.1), shall remain closed to gillnet gear, through October 10, in order to protect any milling summer chum and chinook salmon. Other gear, operating within 500' of the western shore will be required to release summer chum and chinook salmon through September 30.

During the fall chum management period, Treaty Indian commercial fisheries in Area 12 will start on October 19, followed by the opening of Areas 12B and 12C, October 26. Area 12D will remain closed. Treaty Indian fisheries in these areas may continue on a seven-days-per-week schedule for the remainder of the period, through November 20 (Area 12), and November 27 (Areas 12B and 12C).

A hook and line Treaty Indian fishery may be implemented from October 26 through December 6 in Area 12H and Treaty Indian beach seine fisheries may be authorized for up to two days per week in Area 12H during the same period, if inseason information indicates an otherwise unharvestable surplus. The Hoodspout closure itself may also be modified as necessary to avoid wastage of fall chum salmon hatchery surplus. Periodic closures of the hatchery ladder may also be required, to avoid excessive on-station surplus, and to provide harvest opportunity in Area 12H.

Non-treaty fisheries for fall chum salmon in Areas 12 and 12B will start on October 19. In Areas 12 and 12B, gillnet openings are anticipated to occur for 3 days per week (5 weeks), north of Quatsap Pt. and purse seines for 1 day per week, followed by 2 days, reverting to 1 day per week for the final two weeks (4 weeks), depending on in-season management considerations, ending no later than November 20. Fisheries in Area 12C may follow for 1 day per week, as necessary after November 9, ending no later than

November 26. Modifications to this schedule may occur based on inseason information and agreement between the parties. Non-treaty purse seines will be required to have a 5-inch strip, to reduce impacts on chinook salmon, and will be required to release all chinook salmon. Non-treaty gillnets will be required to have a 6 1/4-inch minimum mesh size.

Additional restrictions during the non-treaty fall chum fisheries, in all Hood Canal areas, will include a closure of those waters within 1,000' of the eastern shore of Hood Canal. When the southern portion of Area 12B, and Area 12C are open, those waters of Area 12B within a 1/4 mile radius of Anderson Creek, Duckabush, and Hamma Hamma Rivers, and those waters of Area 12C within a 1/4 mile radius of the Dewatto River will also be closed to protect any milling coho salmon. The Hoodsport and Enetai hatchery closures will also be in effect.

4.1.1.2 Extreme Terminal Marine Areas (Areas 9A, 12A, 12D).

In the extreme terminal marine areas of Hood Canal, commercial fisheries will be regulated to harvest (or provide protection) for specific runs returning to streams or hatcheries in each area.

In Area 12D, with the exception of the westernmost portion (west of Madrona Pt.), which may be opened concurrent with Area 12C, for coho salmon after 9/30, no commercial net fisheries are anticipated in 2003 because of the need to provide secondary protection to returning chinook, summer chum, and fall chum salmon.

In Area 9A, treaty and non-treaty fisheries will harvest returning hatchery coho salmon. Treaty fisheries will also target hatchery origin chum salmon. In Port Gamble Bay, the area north of the fishery markers and south of the tribal dock, in the vicinity of the Little Boston Hatchery, shall be closed to all Treaty set net gear, in order to provide protection to returning hatchery escapement.

In Area 9A, Treaty coho fisheries may start after August 23, using setnet gear. This fishery will operate continuously to the end of the coho management period, and will reopen under the same schedule, for chum salmon, and shall continue through December 6. Non-treaty coho fisheries (gillnet only) in this area shall operate inside Port Gamble Bay for 2 days in the week of 8/24 and thereafter continuously through October 25. Non-treaty fishers shall be required to release chum salmon through 9/30 and all chinook, as well as maintain logbooks.

In the Quilcene/Dabob area (Area 12A), the intent of the managers will be to provide opportunity to harvest the surplus of Quilcene Bay-origin hatchery coho while protecting to the greatest extent feasible the survival and escapement of summer chum salmon expected to return to Area 12A in 2003. An additional objective shall be to capture live summer chum salmon, from the marine area, for use in the joint brood stock program planned for 2003. This program has been developed cooperatively by PNPTC, WDFW, and USFWS. These agencies have also agreed that fisheries in Area 12A shall be monitored through the season, by obtaining all the information that would be needed to assess the effectiveness of pre-season planned measures as well as provide indications concerning the need for in-season adjustments. Additional requirements during the coho fisheries in this area shall include the requirement to turn over to brood stock collection crews all chum salmon captured alive. If brood stock collection crews are not available, all live chum and chinook salmon shall be released unharmed and any mortalities shall be reported to agency personnel. Any chinook, or chum, salmon retrieved dead, by Klallam fishers, shall be kept and recorded on fish receiving tickets, in order to facilitate their being accounted for. Non-treaty and Skokomish treaty fishers may not retain any chinook or chum salmon, through September 30.

In Area 12A, during the coho salmon management period, and extending into the fall chum salmon period, treaty and non-treaty beach seine and hook-and-line gear will be limited to daytime hours from August 24, through October 11, on a Monday through Friday schedule. The fishing area will be restricted to the area north of a east-west line through Point Whitney, excluding the beach area from the mouth of Little Quilcene River to Point Whitney, in order to minimize the possibility of impact to milling Dosewallips River summer chum and chinook salmon and to avoid local concentrations of summer chum salmon. In addition to the above, treaty Indian gillnet fisheries may be implemented, starting the week of August 31, and limited to one day/week through September 30. Inseason management measures will take into consideration summer chum salmon escapement projections and updates, as well as the need to harvest surplus coho salmon. On the basis of inseason information, gillnet fisheries may be maintained, expanded, or reduced, in accordance with procedures outlined in the summer chum salmon BCR.

During the fall chum salmon management period, Area 12A shall remain closed, in order to provide secondary protection. Openings in this area during the late fall chum salmon period may only occur if a harvestable hatchery surplus is identified.

4.1.1.3 Hood Canal Rivers (Areas 82F, 82G, 82J)

No non-treaty commercial fisheries shall be authorized in these areas during 2003. Commercial fisheries in Hood Canal rivers may be authorized for Treaty Indians as follows. In the Skokomish River (Area 82G), during the chinook salmon management period, fisheries may open from 8/3 and shall continue through the coho and chum salmon season with a gillnet closure below SR 106, in order to protect any summer chum salmon dip ins. Weekly openings shall be up to 4 days/week through 9/30.

During the coho salmon management period, fisheries may start in the week of September 21, and may proceed on a schedule of no more than 4 days-per-week through November 1. During the first 10 days of the coho season, the area downstream of SR 106 shall remain closed to gillnet gear.

During the last week of the coho and also during the fall chum salmon management period, fisheries of approximately 4-7 days per week may be authorized starting the week of November 16. At the end of the early-fall chum salmon fishery (after December 6), conservative management measures will be undertaken to minimize potential impacts to late-fall natural chum salmon. These measures shall continue for at least three weeks after the start of any winter steelhead fishery in the week of December 14.

In Purdy Creek (Area 82J), net fisheries may be authorized during the passage of chinook or coho salmon returning to the George Adams Hatchery. However, decisions to conduct fisheries in this area shall be based on in-season information indicating that sufficient chinook and/or coho salmon are available and are in excess of hatchery escapement needs, and escapement requirements will not be impacted.

The Big Quilcene River (Area 82F) shall be closed to all non-selective gear for chinook and chum salmon. Dip nets, hand lines, etc. will be allowed for the harvest of surplus coho salmon in areas upstream from Rogers Street. Beach seine gear may be authorized as necessary from September 7 through October 4, for the harvest of surplus coho salmon in the vicinity of the hatchery. No commercial net fisheries will be authorized in any of the other Hood Canal streams in 2003.

4.1.2 Test and Evaluation Fisheries

In 2003, a test fishery, from August 3 through October 11, should be conducted in Area 9A, in order to determine the entry pattern profile of coho salmon. This test is necessary because of the stock origin change in this area and the lack of consistent commercial fishery data.

4.1.3. Recreational Fisheries

4.1.3.1 Hood Canal Marine Areas - Mainstem Hood Canal (CRC Area 12)

From May 1 through June 30 all marine areas shall remain closed to salmon fishing. The area north of Ayock Pt. will remain closed through August 31, then will open with a 4 fish limit (coho only) through October 15. From July 1 through October 15, the area south of Ayock Point shall be open, with a 4 fish daily limit with retention of no more than 2 chinook salmon (22" min size) and no retention of chum salmon.

From October 16 through December 31, the bag limit shall be four fish, with no more than 1 chinook salmon (22" min size). Hood Canal will be closed to the taking of salmon, from January 1 through February 13, 2004. From February 14 through April 10 the area will be open with a one fish possession limit (chinook 22" min size). From April 11 through April 30, 2004 the entire area will be closed.

4.1.3.2 Extreme Terminal Marine Areas (Areas 12A, 12C, 12D, 12H)

In the Quilcene/Dabob area a closure shall be in effect May 1 through August 15. From August 16 through October 15 this area will be open with a four fish limit (coho only). From October 16 through December 31 the limit shall be 4 fish, with no more than 1 chinook salmon (22"min size). Thereafter, this area's closures and openings shall match those of the mainstem.

In the Hoodsport Hatchery zone (Area 12H), described as waters within 2,000 feet of the mouth of Finch Creek (outside the year round closed area noted below), a daytime fishery shall be authorized with retention of up to 2 chinook salmon (>24" min size), within a 4 salmon bag limit, from July 1 through December 31, 2000. Chum salmon may not be retained from 7/1 through 10/15. At other times of the year this area shall match the mainstem regulations.

The area within 100 feet of Finch Creek (area marked with buoys), adjacent to the Hoodsport Hatchery, shall be closed year round, and the area within 100 yards of the Enetai Hatchery outfall shall be closed at all times. Waters within 100 feet of the Seabeck Highway bridge over Big Beef Creek shall be closed from August 1 through November 30.

4.1.3.3 Hood Canal Rivers.

In freshwater areas, all Hood Canal streams, except as outlined below, shall be closed to angling for salmon.

The Skokomish River shall be open downstream of the U.S. Hwy. 101 bridge from August 1 through September 30, with a one fish limit (12" min size); chum salmon may not be retained during this period. From October 1 through October 15, the bag limit shall be 6 fish with a 12" min size (four adult limit of which only one may be an adult chinook). During these fisheries, chum salmon may not be retained. From October 16 through December 15, same as above, except that chum salmon may be retained. The fisheries described above, will be daytime only, and will have non-buoyant lure restriction and a requirement of single point barbless hooks. The Skokomish River shall be closed to salmon angling from December 16 through April 30.

The Big Quilcene River will be open above Rogers Street to salmon angling using selective gear rules, from August 16 through October 31 with a limit of 4 coho salmon (12" min size). Release of all chum and chinook shall be required.

The Duckabush River, downstream of the PUD power line crossing, and the Dosewallips River downstream of the U.S. Hwy. 101 bridge, shall be open from November 1 through December 15, with a two chum salmon only bag limit. The Dewatto River will be open downstream of the Dewatto/Holly Road crossing, from September 16 through October 31, with a two coho salmon limit and will require single point barbless hooks. The Tahuya River downstream of mile marker 1 above the North Shore Road, will also be open from September 16 through October 31, with the two coho salmon limit and a single point barbless hook requirement.

4.2 Other Recommended Measures

It is recommended that the parties initiate communication during the season, to the extent necessary to address unforeseen circumstances which will likely require the modification on one or more elements of the pre-season management framework. Examples of these may include lower than expected run sizes that may require conservation action, higher than expected interceptions of summer chum salmon, significant changes in the estimated coho run size, low water conditions that serve to delay the emigration of coho salmon from marine areas, and significantly higher, or lower, than expected fall chum run sizes and/or escapements that would require fishery plan modifications.

Also, in addition to routine fishery planning, catch monitoring, assessment and regulation, the following specific activities are recommended:

Emphasis should be placed on the recovery of a minimum of 20% coded-wire tags (CWT) from chinook and coho salmon in Hood Canal fisheries which are crucial to annual escapement assessment, survival rate estimation and run reconstruction. In addition to CWT sampling, the individual aspects in need of attention include fishing effort, catch composition, accounting of catch and biological characteristics of individual stocks. In order to meet these objectives, a coordinated effort between the WDFW the PNPTC Tribes, and the Skokomish Tribe, to develop and implement a sampling and monitoring plan, should allow for an improved assessment of commercial and recreational fisheries in Hood Canal and the Skokomish River.

Commercial fisheries in Hood Canal and the Skokomish River should be intensively sampled and monitored to assure for accurate estimates of total (including incidental) catch of chinook, coho and chum in treaty and non-treaty fisheries. This can be accomplished by estimating daily fishing effort, as catch per unit effort (CPUE) and encounter rates throughout each fishery. Additional tribal and WDFW technicians stationed in all Hood Canal areas and the Skokomish River should provide for improved mainstem coverage of sampling and monitoring.

In order to assess the recreational impact on chinook salmon, the WDFW Puget Sound Sampling Program will conduct a creel survey, separate from the catch record card estimates, to estimate harvest and effort in the Skokomish River. This creel survey will consist of interviewing all anglers who are exiting the fishery, thus obtaining a complete census of this site for the time period sampled.

During the time when summer chum salmon may be present in the fishing areas, and at the spawning grounds, it is recommended that age samples be obtained from summer chum salmon, in order to enable the reconstruction of contributing cohorts. It is also recommended that summer chum spawner survey frequency be increased to once per week in all areas, to improve the accuracy of estimates. Additional baseline samples should be obtained from summer and fall chum spawners for DNA analysis, in order to complete a baseline which contains both races in each river system where they are present.

4.3 Inseason Run Size Updates

For summer/fall chinook salmon, in Area 12H, the frequency of fisheries for chinook salmon will be regulated on the basis of observed hatchery escapements.

In 2002, an effort was undertaken to evaluate available sources of information that would permit inseason assessment of chinook salmon abundance entering the Skokomish River. These included, hatchery escapement patterns, recreational fishery monthly catch and Treaty Indian daily catch and landings information, for the 1980-2000 period. Unfortunately no relationship was found to consequently improve on pre-season estimates. Therefore the pre-season estimated abundance will be used during the season.

In the Quilcene area, in-river escapement estimates for coho and summer chum salmon shall be used inseason to assist in decision making regarding the potential adjustment of fishery restrictions. In the case of summer chum salmon, while no inseason estimate of total abundance will be made, an inseason estimate of anticipated spawning escapement will be made and compared with threshold values of SCSCI. Adjustments to gillnet fishing in Area 12A may be made on the basis of the results obtained, in accordance with procedures of the SCSCI.

For fall chum salmon returning to Hood Canal, fisheries may be adjusted on the basis of inseason updates of run abundance. Methods used to provide inseason assessment of abundance are detailed in Appendix B.1 of this report. This inseason assessment was hindcast over the entire period of years used in its base data. It performed well in nearly all cases, except for the 1997 fishery. In that year, the second half of the return did not match the historical entry pattern and early indicators of abundance did not reflect the sharp decline that followed the peak entry period. If a similar pattern appears in 2003, the inseason update will be inaccurate, therefore inseason management should proceed conservatively.

APPENDIX

- A. Pre-season Forecasting Methods**
- B. Inseason Run Assessment Methods**

A. Pre-season Forecasting Methods

A-1. Summer/Fall Chinook Salmon

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

Return Year (RY)	0+ Lbs. Released in RY-3	Return/Lb	Terminal Run
1984	39,232	0.42295	16,593
1985	40,098	0.50574	20,279
1986	55,499	0.39329	21,827
1987	50,811	0.51412	26,123
1988	55,967	0.50753	28,405
1989	65,510	0.38222	25,039
1990	54,674	0.23280	12,728
1991	100,366	0.18881	18,950
1992	101,102	0.02929	2,961
1993	89,517	0.05293	4,738
1994	78,335	0.04785	3,748
1995	82,895	0.11068	9,175
1996	73,472	0.11065	8,130
1997	32,571	0.23963	7,805
1998	58,652	0.27682	16,236
1999	89,149	0.32795	29,236
2000	87,306	0.27240	23,782
2001	101,591	0.25803	26,214
2002*	89,837	0.41251	37,059
2003	106,363		
Average 1999-2002		0.31772	
2003 Forecast			33,794

(*) : 2002 return data are preliminary and subject to revision.

The 2003 forecast of summer-run Hood Canal chinook salmon is the product of brood 1999 fingerling lbs released from WDFW facilities in 2000, multiplied by the average of post-season estimated terminal area return rates (total terminal run / hatchery fingerling lbs released 3 yrs previous) for the last four return years (1999-2002), which are believed to represent current survival rates (Table A-1-a). The resulting terminal area run forecast is 33,794 chinook salmon. The Hood Canal forecast was apportioned to 30,206

hatchery fish (35.1% George Adams and 54.2% Hoodsport Hatchery) and 3,588 (10.6%) natural fish based on the Hood Canal terminal run reconstruction-based relative contribution of individual Hood Canal management units in the 1999-2002 return years (Table A-1-c). These estimates will be used as inputs to generate ocean recruit forecasts during pre-season simulation modeling.

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

Year	12A	12B	12C	12D	Skokomish	G.A. Hatchery	Hoodsport Hatchery	Total
1984	0	758	0	440	5,302	5,537	4,183	16,220
1985	0	1,908	0	1,040	8,297	5,739	3,044	20,028
1986	0	21	0	169	8,690	10,628	2,221	21,729
1987	0	112	0	64	8,064	12,743	4,311	25,294
1988	0	150	0	79	7,078	13,086	6,888	27,281
1989	0	129	0	158	6,133	13,023	5,175	24,618
1990	0	47	0	49	2,484	8,454	1,577	12,611
1991	0	88	0	73	5,461	9,746	3,514	18,882
1992	0	96	0	20	1,373	490	965	2,944
1993	29	143	0	46	1,385	883	2,242	4,728
1994	4	384	1	30	809	609	1,889	3,726
1995	7	103	2	491	1,398	5,196	1,978	9,175
1996	8	24	1	1	995	3,100	4,001	8,130
1997	27	6	15	7	452	1,887	5,411	7,805
1998	44	287	148	187	1,263	5,949	8,358	16,236
1999	0	900	112	376	2,512	11,939	13,397	29,236
2000	0	438	256	189	1,240	5,403	16,256	23,782
2001*	0	326	636	214	2,616	12,273	10,149	26,214
2002*	0	95	39	114	1,880	11,219	23,712	37,059

Note: The 2001-2002 run reconstruction is preliminary and subject to revision.

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

Year	12A	12B	12C	12D	Skokomish	G.Adams	Hoodsport
1999	0.00000	0.03078	0.00383	0.01286	0.08592	0.40837	0.45824
2000	0.00000	0.01842	0.01076	0.00795	0.05214	0.22719	0.68354
2001	0.00000	0.01244	0.02426	0.00816	0.09979	0.46818	0.38716
2002	0.00000	0.00256	0.00105	0.00308	0.05073	0.30273	0.63984
'99 - 2002 Mean	0.00000	0.01605	0.00998	0.00801	0.07215	0.35162	0.54220

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

Hood Canal Production Unit	Terminal Run Forecast	Proportion
12B	542	0.01605
12C	337	0.00998
12D	271	0.00801
Skokomish	2,438	0.07215
Natural Subtotal	3,588	0.10619
George Adams	11,883	0.35162
Hoodsport	18,323	0.54220
Hatchery Subtotal	30,206	0.89381
Total	33,794	1.00000

Note: The forecasted proportions are derived from the 1999-2002 mean return.

A-2. Pink Salmon.

A-2.1 Natural Runs

The 2003 return of naturally reared Hood Canal pink salmon was forecast as recruitment to all fisheries (Canadian and domestic) and escapement, using the product of the 2001 brood year estimated escapement (96,664) (Table A-2-a) multiplied by the average estimated "Cycle 1" return rate of (2.045) for a natural forecast of 197,664 natural pink salmon total recruits (Table A-2-b).

Table A-2-a. Corrected Pink Salmon Natural Run Reconstruction for Hood Canal

Return Year	Hood Canal Natural Escapement	Hood Canal Natural Terminal Run	Hood Canal Total Natural Recruits	Hoodsport Hatchery Recruits	Hood Canal Total Recruits
1959	30,600	30,600	49,421	2,471	51,892
1961	36,900	36,900	47,951	3,833	51,784
1963	503,200	503,200	1,200,196	15,837	1,216,033
1965	160,500	160,500	226,069	606	226,675
1967	269,400	271,100	493,000	4,092	497,092
1969	42,100	42,100	59,714	3,206	62,920
1971	104,100	104,100	143,875	3,303	147,178
1973	47,100	47,200	76,748	2,455	79,203
1975	12,600	12,600	20,047	3,739	23,786
1977	44,300	44,300	76,762	10,067	86,829
1979	37,300	37,400	84,235	9,797	94,032
1981	6,550	7,150	13,639	3,395	17,034
1983	25,200	25,400	29,247	622	29,869
1985	64,100	66,200	90,812	2,167	92,979
1987	62,200	64,000	77,417	11,092	88,509
1989	60,970	80,100	130,646	4,583	145,961
1991	118,450	118,487	180,734	5,037	186,862
1993	35,406	35,406	40,093	13,025	53,118
1995	31,306	31,306	39,531	32,102	71,633
1997	8,363	8,363	14,684	37,738	52,422
1999	9,479	9,479	9,592	7,741	17,333
2001	96,664	96,664	100,861	74,854	175,715

Table A-2-b. Hood Canal Natural 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	1.567	1961	32.526	1963	0.449
1965	3.072	1967	0.222	1969	3.417
1971	0.737	1973	0.426	1975	6.092
1977	1.901	1979	0.366	1981	4.465
1983	3.604	1985	1.208	1987	2.100
1989	2.964	1991	0.338	1993	1.116
1995	0.469	1997	1.148	1999	10.640
2001					
Average:	2.045		0.618		3.438
Std. Dev.	1.209		0.439		1.955
2003 Forecast Recruits					197,664

The WDFW provided a separate forecast of 185,597 recruits, using the same general methodology approach. The relatively small difference (approx. 6%) was most likely the result of differences in historical run reconstruction, which was used as a basis for the forecasts. That difference will be addressed in the near future.

A-2.2 Hatchery runs.

The 2003 return of hatchery reared Hood Canal pink salmon was forecast as recruitment to all fisheries and escapement, using the product of the 2001 brood year fingerling pounds released from the Hoodsport hatchery (3,244), multiplied by the long term average recruits per pound rate estimated for the Hoodsport hatchery (2.3515). The resulting recruit forecast is 7,330 pink salmon recruits (Table A-2-c).

For hatchery returns, the WDFW forecast was 7,659. Again, the relatively small difference (approx. 4%) was due to differences in historical run reconstruction, plus the fact that the WDFW forecast was based on cycle year survival rates, rather than long term mean survival.

Table A-2-c. Hoodspout Hatchery Pink Salmon Return Rates.

Brood Year	Lbs. Released	Total Recruits	Recruits/Lb
1959	2,515	3,833	1.5241
1961	492	15,837	32.1890
1963	1,209	606	0.5012
1965	1,283	4,092	3.1894
1967	1,416	3,206	2.2641
1969	2,399	3,303	1.3768
1971	3,071	2,455	0.7994
1973	2,104	3,739	1.7771
1975	3,477	10,067	2.8953
1977	3,496	9,797	2.8023
1979	2,253	3,395	1.5069
1981	1,748	622	0.3558
1983	655	2,167	3.3084
1985	2,152	11,092	5.1543
1987	5,625	4,583	0.8148
1989	1,913	5,037	2.6330
1991	4,453	13,025	2.9250
1993	6,532	32,102	4.9146
1995	7,623	37,738	4.9505
1997	7,851	7,741	0.9860
1999	3,117	74,854	24.0148
2001	3,244		
BY 1959-99 Average			2.3515
2003 Forecast		7,330	

Note: Values in boldface were excluded from the analysis.

A-3. Summer Chum Salmon

A-3.1 Natural Runs

The 2003 forecast of the Hood Canal natural summer-timed chum salmon returns was forecast as total recruitment to all fisheries and escapements returning to the Mainstem Hood Canal, and SE Hood Canal management units.

The runs were forecasted as the mean of the last 4 years' (one four-year cycle) returns, as estimated by the current run reconstruction (Table A-3-a). Insufficient age-specific information is currently available for summer chum salmon. The forecasted recruitment, to all fisheries (domestic and Canadian) and escapement, for summer chum, is 3,320 for the Mainstem and 834 for the SE Hood Canal units, for a total of 4,154. Additionally, summer chum salmon are expected to return to Hamma Hamma River (Mainstem unit) from supplementation and reintroduction projects. However, those numbers are small and not presently quantifiable.

A-3.2 Aggregate Runs - Quilcene/Dabob.

The run of fish returning to Quilcene/Dabob is an aggregate run which includes both naturally reared and supplementation fish, reared at the Quilcene National Fish Hatchery. The forecasted recruitment, to all fisheries and escapement, is 5,794. Methods used to estimate the forecast are identical to those used for the other Hood Canal units.

Table A-3-a. Hood Canal Summer Chum Salmon Recruits.

Year	Mainstem Hood Canal	Quilcene/Dabob	SE Hood Canal	Hood Canal Total
1974	11,810	944	1,067	13,821
1975	19,370	3,235	3,757	26,362
1976	35,613	11,206	21,869	68,688
1977	11,159	1,918	2,587	15,664
1978	18,791	5,555	716	25,062
1979	7,844	734	817	9,395
1980	8,867	1,932	2,133	12,932
1981	4,331	761	477	5,569
1982	5,522	1,494	956	7,972
1983	543	2,351	597	3,491
1984	1,279	1,486	502	3,267
1985	1,765	1,025	1,417	4,207
1986	1,284	1,483	5,001	7,768
1987	150	2,722	1,030	3,902
1988	2,191	2,540	915	5,646
1989	614	1,599	2,184	4,397
1990	259	623	577	1,459
1991	700	1,174	321	2,195
1992	1,953	1,237	183	3,373
1993	402	183	283	868
1994	1,170	896	891	2,957
1995	4,394	4,830	760	9,984
1996	10,734	9,801	511	21,046
1997	681	8,199	493	9,373
1998	758	3,201	255	4,214
1999	778	3,554	174	4,506
2000	2,035	6,704	757	9,496
2001	4,248	7,595	1,516	13,359
2002*	6,218	6,044	890	13,152
2003 Forecast ('99-'02 Mean)	3,320	5,974	834	10,128

* 2002 Data is preliminary and subject to revision.

A-4. Coho Salmon

A-4.1 Natural Runs

The forecasted recruitment of 2003 Hood Canal natural runs was based on linear regression models that related the return of jack coho at BBC to Hood Canal December Age 2 recruits in the subsequent run year. Two approaches were used, the first related the total return of jacks to Hood Canal recruits (indicated below as model “A”); the second related the return of BBC origin jacks (shown as tagged) to Hood Canal recruits (indicated below as model “B”). We decided to take the mean of results obtained because there was no statistical difference between the “intercept” and “through the origin” runs. Each of these models was run through the origin as well as the intercept, utilizing brood years 1983-1998 (Table A-4-a). These models were examined by jackknife hindcasting and found to be relatively unbiased. The final form of each regression is shown below:

$$(A_1) \text{ Hood Canal Recruitment} = 394.601 * (\text{Total BBC Jacks})$$

$$(A_2) \text{ Hood Canal Recruitment} = 21871.023 + (330.832 * (\text{Total BBC Jacks}))$$

$$(B_1) \text{ Hood Canal Recruitment} = 507.312 * (\text{BBC Tagged Jacks})$$

$$(B_2) \text{ Hood Canal Recruitment} = 23635.605 + (419.979 * (\text{BBC Tagged Jacks}))$$

Relevant statistics of the model used to derive the 2003 forecast are shown below.

Using Brood Years 1983-1998				
Model Version	A ₁	A ₂	B ₁	B ₂
F-Ratio at p = 0.000	142.171	21.287	153.524	24.815
Std Error of Estimate	40278.404	40271.852	38898.001	38397.911
N	16	16	16	16
Intercept	0	21871.023	0	23635.605
Slope	394.601	330.832	507.312	419.979
Correlation Coeff.	0.905	0.575	0.911	0.614
2002 Jacks (X)	91	91	72	72
2003 Forecast (Y)	35,909	51,977	36,526	53,874
Agreed to 2003 Forecast: Mean Y of A1 through B2				44,571

For 2003, we agreed to develop the pre-season forecasts by taking the mean of the results obtained from A₁ through B₂, resulting in a DA2 forecast of 44,571. These recruits were subsequently apportioned to primary and secondary units on the basis of the distribution of their parent brood escapement. The total forecast of 44,571 natural DA2 recruits was thus apportioned into 43,141 from primary and 1,430 from secondary units, on the basis of parent brood spawner distribution (Table A-4-b).

Table A-4-a. 2002 Hood Canal Natural Coho Forecast Data

Brood Year	Big Beef Creek Total Smolts	Big Beef Total Jacks	Big Beef Tagged Jacks	Hood Canal Total Dec Age-2 Recruits
1975	35,025			
1976	17,619		36	
1977	45,634		452	
1978	20,715		265	
1979	41,054		398	
1980	25,225			
1981	25,333		210	
1982	36,636		554	
1983	25,720	427	346	211,127
1984	24,479	445	350	232,860
1985	11,510	201	121	40,236
1986	26,534	314	208	117,460
1987	17,594	336	234	118,316
1988	19,565	173	122	70,422
1989	23,646	167	144	61,949
1990	18,677	273	202	64,929
1991	13,071	206	149	138,845
1992	18,431	188	157	94,029
1993	16,574	224	185	71,422
1994	25,820	410	298	145,541
1995	40,828	610	510	176,029
1996	22,222	60	45	23,166
1997	20,967	96	85	54,924
1998	47,089	189	179	157,537
1999	21,855	114	85	
2000	24,413	91	72	

Table A-4-b. Apportionment of the 2003 Hood Canal Natural Coho Forecast

Area	Escapement Capacity	Escapement BY 1999	Management Unit Type	Proportion of Brood Escapement	December Age-2 Recruits
12 / 12B	28.88%	8,687	Primary	31.68%	14,119
12C / 12D	31.66%	9,569	Primary	34.89%	15,552
Skokomish	29.01%	8,288	Primary	30.22%	13,470
9A	1.25%	210	Secondary	0.77%	341
12A	9.20%	670	Secondary	2.44%	1,089
Primary Subtotal	89.55%	26,544		96.79%	43,141
Secondary Subtotal	10.45%	880		3.21%	1,430
Grand Total	100.00%	27,424		100.00%	44,571

Table A-4-c. Escapement of Coho Salmon to Primary Natural Spawning Areas of Hood Canal

Year	North (12-12B)	South (12C-12D)	Skokomish	Total
1986	17,485	18,943	3,432	39,860
1987	6,922	7,498	3,510	17,930
1988	4,623	5,009	1,948	11,580
1989	6,924	7,502	934	15,360
1990	2,664	2,885	1,281	6,830
1991	5,433	5,886	1,541	12,860
1992	8,199	8,882	2,179	19,260
1993	10,052	10,890	1,327	22,269
1994	21,289	23,063	12,128	56,480
1995	17,049	18,470	5,560	41,079
1996	16,254	17,609	4,008	37,871
1997	37,338	40,450	17,568	95,356
1998	40,323	44,420	14,957	99,700
1999	6,854	7,550	1,847	16,251
2000	8,687	9,569	8,288	26,544
2001	35,134	38,703	20,601	94,438

Table A-4-d. Hood Canal Hatchery and Net Pen Smolt to Dec-2 Recruit Survival

Brood Year	George Adams Hatchery			Port Gamble Net Pens			Quilcene NFH			Quilcene Bay Net Pens			
	Smolts	Recruits	R/Sm	Smolts	Recruits	R/Sm	Smolts	Recruits	R/Sm	Smolts	Recruits	R/Sm	
1976	30,171						397,562						
1977	1,816,704						490,611						
1978	1,042,520						377,098						
1979	1,406,424			682,900			502,189						
1980	322,580			454,000			498,166						
1981	351,474			400,000			352,298						
1982	364,000			394,000			271,035						
1983	310,100	106,593	0.34374	586,400	89,105	0.15195	223,128						
1984	312,800	52,163	0.16676	394,400	73,890	0.18735	542,480			247,221	40,095	0.16218	
1985	355,400	20,960	0.05898	351,900	9,450	0.02685	617,231			85,575	4,363	0.05098	
1986	337,700	32,908	0.09745	429,141	29,183	0.06800	574,171	<i>98,188</i>	<i>0.17101</i>	193,522	16,075	0.08307	
1987	298,000	28,068	0.09419	407,600	157,116	0.38547	753,390	75,121	0.09971	146,000	30,269	0.20732	
1988	310,700	14,698	0.04731	383,629	74,033	0.19298	491,303	64,066	0.13040	311,327	21,484	0.06901	
1989	300,300	7,106	0.02366	298,944	53,439	0.17876	352,556	9,874	0.02801	266,193	7,834	0.02943	
1990	307,300	7,894	0.02569	403,600	32,220	0.07983	501,254	27,662	0.05519	353,263	18,203	0.05153	
1991	304,197	20,054	0.06592	383,419	63,120	0.16462	397,701	49,061	0.12336	337,800	24,903	0.07372	
1992	301,019	15,688	0.05212	361,553	13,281	0.03673	400,700	34,709	0.08662	287,187	8,379	0.02918	
1993	303,054	31,320	0.10335	414,844	4,672	0.01126	425,334	29,577	0.06954	216,737	1,864	0.00860	
1994	396,084	17,542	0.04429	378,686	8,741	0.02308	625,700	40,118	0.06412	0			
1995	434,140	6,963	0.01604	342,828	8,450	0.02465	425,971	17,650	0.04143	220,000	5,756	0.02616	
1996	527,317	11,877	0.02252	441,656	18,864	0.04271	452,203	7,289	0.01612	225,269	2,780	0.01234	
1997	534,554	22,753	0.04256	420,482	3,999	0.00951	437,222	22,986	0.05257	189,951	16,752	0.08819	
1998	502,266	40,317	0.08027	391,765	8,682	0.02216	368,399	23,579	0.06400	208,000	6,985	0.03358	
1999	493,992			432,847			428,995			0			
2000	500,732			432,161			411,674			210,627			
Average (1996-98)			0.04845				0.02479				0.04423	0.04470	
*2003 Forecast:			24,262				10,715				18,209	9,416	

* 2003 Forecast Preliminary due to RRTerm program error in allocation of Quilcene area stocks.

Note: Values in italics indicate untagged production units. Values in boldface were excluded from the analysis.

A-4.2 Hatchery Runs

The 2003 forecast, utilized survival rates from the 1996 through 1998 period of broods (Table A-4-d). Historical marine survival rates were estimated from CWT-based cohort reconstruction of December Age-2 recruits, as were those of natural coho. Because there are several enhancement facilities in Hood Canal, and tag data were not available for all facilities for all years, marine survival rates were estimated from reconstructed cohorts, using the assumption that untagged releases contributed to preterminal fisheries in a way that maintained the same ratio to tagged releases, as estimated by RRTERM to have entered the Hood Canal terminal area (Table A-4-d). A program error was identified in the RRTERM model, causing a misallocation of the Quilcene area stocks. When the problem is corrected, the RRTERM model will be re-run and the forecast will be updated.

The 2003 forecast of 62,602 hatchery reared December Age-2 coho recruits (Table A-4-d) was predicted from brood year 2000 smolt releases multiplied by the average estimated marine survival rate for each facility's smolts from the three latest available brood years. In all cases, this meant brood years 1996-1998 (Table A-4-d).

A-5. Fall Chum Salmon

The 2003 forecast of the Hood Canal fall chum salmon run was estimated separately for natural production units, off-station augmented production in natural rearing areas, and individual hatchery production units. The following descriptions of methods and source data are intended to provide documentation of the methods and approaches used by PNPTC and WDFW. Final forecasts, given the small difference in results, were made using the mean of the results obtained by the PNPTC and WDFW, for each production unit.

A-5.1 Natural Runs

A-5.1.1 Natural Forecasts (PNPTC)

The 2003 return of Hood Canal natural fall-timed chum salmon of each returning age group (3, 4, and 5 year olds) was forecast using the available mean return-per-spawner-at-age rates for broods 1994-1999. The mean recruit-per-spawner return rates were 1.30195, 1.03418, and 0.05446, for 3, 4, and 5 year-olds respectively (Table A-5-a). These age specific rates were used because they may better reflect the recent trends of survival. The average rates of return were multiplied with the 2000, 1999, and 1998 brood escapements (37,130; 33,923; and 101,632; respectively) to estimate the total 2003 forecast of **88,958** Hood Canal natural fall chum returning to Puget Sound, before the addition of anticipated returns from instream supplementation projects. The Hood Canal natural run forecast was further apportioned to individual production units (Tables A-5-e and A-5-f), on the basis of relative proportion attributable to each production unit's spawners (brood year escapement), for each returning age group.

The grand total return to each natural production unit was estimated by adding the estimated return from instream enhancement and supplementation efforts. The forecast of this latter component is described under "Hatchery runs" (Section A-5.2).

A-5.1.2 Natural Forecasts (WDFW)

The 2003 return of natural fall-timed chum salmon to Hood Canal was forecast as a portion of the total return of all Puget Sound natural fall-timed chum. The Puget Sound return 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 three-year old forecast was derived by multiplying the 2000 natural escapement by the mean even-brood R/S value to get a total return of 2000 brood offspring. That number was then multiplied by the mean return at age 3 for even-year broods, yielding the 2003 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 of 795,872 (Table A-5-b).

When age and run size data from the 2002 return became available, a sibling forecast was prepared. This method uses long-term average return-year age composition to predict 2003 returns of age 4 fish based on the 2002 age 3 return of their siblings, and to predict the 2003 age 5 return based on the 2001 age 3 and 2002 age 4 returns of their siblings (Table A-5-c). The final forecast averaged the R/S-based and sibling-based methods, yielding a Puget Sound forecast of 921,476 (Table A-5-d).

The return of each age group to Puget Sound was apportioned to individual regions (including Hood Canal) and regional production units, using proportions of the parent escapement of each brood into each production unit. The resulting forecast for Hood Canal natural fall chum salmon is **102,279** (Table A-5-d). The forecasts for individual production units are shown in Table A-5-g.

Table A-5-a. Hood Canal Natural Fall Chum Returns-at-Age per Spawner

Brood Year	Brood Escapement	3's	4's	5's	Total
1968	47,802	0.58851	1.63843	0.09531	2.32225
1969	30,070	0.55347	1.14772	0.09264	1.79383
1970	41,698	0.55974	1.58097	0.01314	2.15385
1971	41,139	0.58684	0.41253	0.33536	1.33473
1972	41,602	0.26600	1.27782	0.00000	1.54382
1973	27,870	1.77435	2.60442	0.07442	4.45319
1974	52,224	0.81058	4.42768	0.07083	5.30909
1975	16,266	7.39128	0.05031	0.00000	7.44159
1976	48,078	0.53106	0.20950	0.03284	0.77340
1977	26,074	2.63777	2.75182	0.13638	5.52597
1978	79,156	0.00000	0.60521	0.05628	0.66149
1979	14,323	1.90578	2.12514	0.00000	4.03092
1980	21,672	0.51986	2.14284	0.23020	2.89290
1981	14,311	3.49606	12.57573	0.62964	16.70143
1982	12,134	2.88372	7.08431	0.94405	10.91208
1983	7,121	9.05977	24.36484	1.13305	34.55766
1984	22,751	1.29322	5.88293	0.37653	7.55268
1985	50,910	0.47585	2.67123	0.33942	3.48650
1986	29,549	0.00000	3.15530	0.44358	3.59888
1987	24,481	0.00000	3.54539	1.04646	4.59185
1988	30,704	1.51417	8.58988	1.42979	11.53384
1989	24,873	0.11185	6.46375	5.71932	12.29492
1990	20,811	1.48264	8.26697	0.69326	10.44287
1991	44,745	0.59753	1.58643	0.12973	2.31369
1992	96,381	2.21238	4.21549	0.20013	6.62800
1993	67,771	1.07479	1.38931	0.10130	2.56540
1994	151,822	0.30984	0.88726	0.03062	1.22772
1995	119,344	0.58343	0.37619	0.01541	0.97503
1996	251,804	0.01674	0.18578	0.00000	0.20252
1997	53,493	0.62363	2.02701	0.17179	2.82243
1998	101,632	1.52336	1.69466		
1999	33,923	4.75467			
2000	37,130				
2001	101,902				
Mean: Brood Years 1968-98 (exclusive of outliers, in bold)					
All Odd Years	37,519	1.55805	2.83764	0.30040	5.19300
All Even Years	65,614	0.90699	3.34336	0.30777	4.51703
All Years	52,020	1.21082	3.05240	0.30421	4.83087
Mean: Brood Years 1994-99					
All Years	135,619	1.30195	1.03418	0.05446	0.80176
2003 Forecast		48,341	35,082	5,534	88,958

Table A-5-b. 2003 Puget Sound Natural Fall Chum R/S Based WDFW Forecast

Parent Brood	Age	Parent Escapement	Mean R/S ¹	Estimated R/S (all ages)	Mean Age Composition ¹	Natural Forecast
1998	5	888,442	2.57	2,284,126	0.051	115,759
1999	4	337,400	3.11	1,049,657	0.565	593,107
2000	3	193,763	2.57	498,153	0.175	87,006
					Total	795,872

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

Table A-5-c. 2003 Puget Sound Natural Fall Chum WDFW Sibling Forecast for Age 4 and 5 Returns

Age 4 (1999 Brood) Sibling Forecast		Age 5 (1998 Brood) Sibling Forecast	
Age 3 Run from 1999 Brood	535,963	Age 3+4 Run from 1998 Brood	2,444,313
Age 3 Avg. Proportion of Brood	0.365	Age 3+4 Avg. Proportion of Brood	0.949
Est. 1999 Brood Total Return	1,468,161	Est. 1998 Brood Total Return	2,574,804
Age 4 Avg. Proportion of Brood	0.565	Age 5 Avg. Proportion of Brood	0.051
Age 4 Sibling Forecast	829,583	Age 5 Sibling Forecast	130,491

Table A-5-d. 2003 WDFW Puget Sound Natural Chum R/S, Sibling and Average of Forecasts

	R/S	Sibling	Average	HC Parent Escapement Proportion	HC Forecast by Age
Age 3 (2000 Brood) Forecast	87,006	n/a	87,006	0.192	16,673
Age 4 (1999 Brood) Forecast	593,107	829,583	711,345	0.101	71,521
Age 5 (1998 Brood) Forecast	115,759	130,491	123,125	0.114	14,085
Total Forecast	795,873	960,073	921,476		102,279

Table A-5-e. 2003 Hood Canal Natural Fall Chum Parent Brood Escapement Distribution

Area	2000	1999	1998
9A	0.00%	0.00%	0.00%
12	0.95%	4.33%	3.11%
12A	0.27%	14.82%	0.86%
12B	44.92%	27.51%	46.30%
12C	12.28%	25.86%	17.44%
82G	18.78%	8.54%	9.56%
12D	22.80%	18.94%	22.73%

Table A-5-f. Apportionment of the PNPTC 2003 Hood Canal Natural Fall Chum Run

Area	3's	4's	5's	Total
9A	0	0	0	0
12	459	1,519	172	2,150
12A	131	5,199	48	5,377
12B	21,715	9,651	2,562	33,928
12C	5,936	9,072	965	15,974
82G	9,078	2,996	529	12,604
12D	11,022	6,645	1,258	18,924
Total	48,341	35,082	5,534	88,958

Table A-5-g. Apportionment of the WDFW 2003 Hood Canal Natural Fall Chum Run

Area	3's	4's	5's	Total
9A	0	0	0	0
12	158	3,097	438	3,693
12A	45	10,599	121	10,766
12B	7,490	19,675	6,521	33,686
12C	2,047	18,495	2,456	22,999
82G	3,131	6,108	1,347	10,586
12D	3,801	13,546	3,202	20,549
Total	16,673	71,521	14,085	102,279

A-5.2 Hatchery Runs.

The 2003 hatchery-origin returns (including in-stream augmentation) of fall-timed chum salmon were generally forecasted using average returns-at-age-per-pound of fingerlings released, to Puget Sound net fisheries and escapements, using historical run sizes from the fall chum database, historical releases from each facility, and applying them to releases from brood years 1998, 1999, and 2000. In estimating the returns, the following information was used for each facility. Off-station production, resulting from instream augmentation programs was estimated separately and was then added to the forecasted return to natural spawning areas.

A-5.2.1 Forecasts of Instream Augmentation

Egg box and fry-augmented runs to streams of areas 12, 12B, 12C, 12D, 82G: PNPTC applied one half of the mean return rates of age 3, age 4, and age 5 fish per pound planted at Hoodspout Hatchery (1965-1971 broods). (Tables A-5-h and A-5-i). The resulting forecast for 2003 is 25 fish. WDFW applied return rates that were based on rates for corresponding hatcheries, reduced by a factor of 2 to 4, to compensate for the smaller size at release, resulting in a forecast of 28 fish (Table A-5-n). This forecast was apportioned to each area, according to the volume released from each brood year. The resulting estimates were added to the corresponding natural run components.

Table A-5-h. Hood Canal Fall Chum, Off-Station Lbs. Planted

Area	BY 2000		BY 1999		BY 1998	
	Lbs	%	Lbs	%	Lbs	%
9A	0		0		0	0.00%
12	0		0		0	0.00%
12B	0		0		205	37.14%
12A	0		0		0	0.00%
12C	0		0		0	0.00%
Skokomish	0		0		0	0.00%
12D	0		0		347	62.86%
Total	0		0		552	

Table A-5-i. Apportionment of the 2003 Hood Canal Fall Chum Off-Station Forecast

Area	3's	4's	5's	Total
9A	0	0	0	0
12	0	0	0	0
12B	0	0	9	9
12A	0	0	0	0
12C	0	0	0	0
82G	0	0	0	0
12D	0	0	16	16
Total	0	0	25	25

A-5.2.2 Hatchery On-Station Forecasts (PNPTC)

Hoodsport Hatchery: Mean return rate of age 3, 4, and 5 fish per pound planted at Finch Creek (1994-1999 broods) (Table A-5-j). The resulting forecast for 2003 is 121,963.

George Adams/McKernan Hatcheries: Mean return rate of age 3, age 4, and age 5 fish per pound released (1994-99 broods). The age specific return rate for brood 1998 age 3 was determined to be an outlier and was excluded from the estimation of the age specific mean return rates (Table A-5-k). The resulting forecast for 2003 is 98,482.

Quilcene Hatchery: Mean return rate of age 3, age 4 and age 5 fish per pound planted at Walcott Slough (1965-1974 and 1979-1984 broods). The age specific return rates for age 3 and age 5 (brood 1968) were determined to be outliers and were excluded from the estimation of the age specific mean return rates (Table A-5-l). The resulting forecast for 2003 is based on the fingerling releases of 77 lbs. (BY 2000), 4,155 lbs (BY 99), and 2,916 lbs (BY 98), which were used to estimate the return of 3, 4, and 5-year olds respectively, for a total return of 11,909.

Little Boston Hatchery and Port Gamble Pens: Mean return rate of age 3, age 4 and age 5 fish per pound planted at Hoodsport Hatchery (1965-1971 broods) (Table A-5-j). The resulting forecast for 2003 is based on the fingerling releases of 871 lbs (BY 2000), 930 lbs (BY 99), and 1,627 lbs (BY 98), which were used to estimate the return of 3, 4, and 5-year olds respectively, for a total return of 3,222.

Enetai Hatchery: Mean return rates of age 3, age 4 and age 5 fish per pound planted (1994-1999 broods). (Table A-5-m). The resulting forecast for 2003 is based on the fingerling releases of 194 lbs. (BY 2000), 1,542 lbs (BY 99), and 3,270 lbs (BY 98), which were used to estimate the return of 3, 4, and 5-year olds respectively, for a total return of 3,546.

The PNPTC total forecast of on-station hatchery-origin fall chum for 2003 is 239,122.

A-5.2.3 Hatchery Forecasts (WDFW)

The 2003 return of hatchery-origin fall chum was forecast by multiplying pounds released from each facility by long-term, even/odd year specific average return rates for that facility. For example, 3-year old returns were forecast by multiplying pounds released of 2000 brood year chum by the long-term, even-brood year age 3 return rate for that hatchery. Age 4 and age 5 returns were forecast by the same method. For off-station releases (volunteer/cooperative projects), return rates were based on rates for corresponding hatchery, reduced by a factor of 2 or 4 to compensate for smaller size at release. Individual station forecasts are shown in the tables below. A summary of the WDFW forecasts by age are shown for Hood Canal hatcheries in Table A-5-n. The WDFW total Hood Canal hatchery on-station forecast is 247,706.

**Table A-5-j. Fall Chum Returns-per-Pound,
by Age at Return from Hoodport Hatchery Releases**

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

Continued ...

**Table A-5-j (cont'd). Fall Chum Returns-per-Pound,
by Age at Return from Hoodspout Hatchery Releases**

1985	39,279	2.92389	5.00571	0.20595	8.13555
1986	33,036	0.53259	2.21872	0.20579	2.95710
1987	40,323	0.42814	3.70929	0.14736	4.28479
1988	36,877	3.13411	7.17034	0.29712	10.60157
1989	35,149	0.71847	1.79583	0.50845	3.02275
1990	38,422	4.27142	7.01940	0.37401	11.66483
1991	39,379	3.01183	1.98098	0.07460	5.06741
1992	33,678	2.33155	3.93700	0.12497	6.39352
1993	33,920	1.77835	4.03487	0.17676	5.98998
1994	37,075	0.73558	1.96470	0.03943	2.73971
1995	37,583	1.29662	0.93342	0.01997	2.25001
1996	25,374	0.35824	1.78350	0.05543	2.19717
1997	30,276	0.24440	2.52591	0.08956	2.85987
1998	37,534	2.61358	3.17189		
1999	33,197	3.75705			
2000	34,067				
2001	59,964				
All Odd Years	24,164	1.81082	2.84783	0.17110	4.71527
All Even Years	28,093	1.41578	3.72541	0.12860	5.27334
All Years	26,072	1.61894	3.28662	0.15118	4.98585
All Years 65-71	2,655	0.95938	2.41136	0.09131	3.46205
All Years 72-99	31,926	1.78384	3.51354	0.16794	5.39610
All Years 94-99	33,507	1.50091	2.07588	0.05110	2.39563
2003 PNPTC Forecast		51,132	68,913	1,918	121,963
2003 WDFW Forecast		51,455	104,000	5,346	160,801

**Table A-5-k. Fall Chum Returns-per-Pound, by Age at Return
from G.Adams/McKernan Hatchery Releases**

Brood Year	Release Lbs.	3's	4's	5's	Total
1978	18,717	0.11901	0.85327	0.15188	1.12416
1979	40,273	0.36752	0.61002	0.06715	1.04469
1980	24,418	0.30902	2.10810	0.05751	2.47463
1981	12,028	3.24075	4.43634	0.36758	8.04467
1982	26,780	1.03328	3.20556	0.20036	4.43920
1983	25,917	1.25574	8.01500	0.44456	9.71530
1984	28,601	1.49188	1.18815	0.05936	2.73939
1985	24,500	0.78202	1.85405	0.20669	2.84276
1986	36,329	0.12036	1.56008	0.24038	1.92082
1987	30,566	0.10195	1.44458	0.20499	1.75152
1988	31,083	1.45527	4.69637	0.54805	6.69969
1989	32,315	0.52929	2.25103	0.20309	2.98341
1990	17,032	0.47710	5.81499	0.43246	6.72455
1991	30,024	1.45064	1.33176	0.05341	2.83581
1992	25,235	1.59492	2.86789	0.09179	4.55460
1993	27,016	1.21873	2.78823	0.32053	4.32749
1994	27,723	0.54142	3.79484	0.03621	4.37247
1995	22,624	3.11094	1.06483	0.00880	4.18457
1996	23,138	0.26978	0.51881	0.11447	0.90306
1997	27,884	0.07039	5.16473	0.21978	5.45490
1998	33,530	5.50952	4.10412		
1999	27,365	4.92693			
2000	8,486				
2001	40,142				
Average Return Brood Years (1978-99) excluding outliers in bold.					
Odd Years	27,319	1.55045	2.89606	0.20966	4.31851
Even Years	26,599	0.74120	2.79202	0.19325	3.59526
All Years	26,959	1.16509	2.84156	0.20145	3.95688
All Years 94-99	27,044	1.78389	2.92947	0.09482	3.72875
2003 PNPTC Forecast		15,138	80,165	3,179	98,482
2003 WDFW Forecast		5,940	63,685	4,731	74,356

Table A-5-I. Fall Chum Returns-per-Pound, by Age at Return for Walcott Slough Releases

Brood Year	Release Lbs.	3's	4's	5's	Total
1965	2,971	0.50151	1.05452	0.00849	1.56452
1966	2,903	0.84004	2.96892	0.02785	3.83681
1967	3,059	1.28706	1.71775	0.12019	3.12500
1968	1,615	2.95329	6.07059	0.82275	9.84663
1969	3,185	0.65411	3.16035	0.21257	4.02703
1970	7,612	0.89432	2.10500	0.02127	3.02059
1971	6,198	0.94671	1.07801	0.02229	2.04701
1972	5,998	0.65865	3.40362	0.04857	4.11084
1973	15,437	0.90626	1.41069	0.00213	2.31908
1974	10,192	1.41133	2.31994	0.04420	3.77547
1975	21,245	0.42200	0.34770	0.00374	0.77344
1976	32,295	0.04795	0.04098	0.00089	0.08982
1977	21,573	0.27020	0.25917	0.02519	0.55456
1978	13,970	0.01073	0.14823	0.01255	0.17151
1979	7,552	0.89457	1.59961	0.08287	2.57705
1980	2,844	1.85564	2.69076	0.03265	4.57905
1981	4,658	1.27643	1.71673	0.15167	3.14483
1982	1,804	1.94934	5.91494	0.33628	8.20056
1983	1,994	1.67552	5.31753	0.24362	7.23667
1984	1,301	1.52052	1.92800	0.06040	3.50892
Average Brood Years (1965-84; w/o 1975-78) excluding outliers in bold.					
Odd Years	5,632	1.01777	2.13190	0.10548	3.25515
Even Years	4,284	1.30426	3.42522	0.08160	4.43318
All Years	4,958	1.15147	2.77856	0.09434	3.80490

Table A-5-m. Fall Chum Returns-per-Pound, by Age at Return for Enetai Hatchery Releases

Brood Year	Release Lbs.	3's	4's	5's	Total
1976	3,696	0.18155	0.75214	0.00000	0.93369
1977	5,785	1.53198	3.31116		
1978	6,514	1.40297		0.01172	
1979	2,666		0.62223	0.09213	
1980	3,053	0.43328	1.81825	0.10249	2.35402
1981	4,985	2.12202	2.89871	0.10103	5.12176
1982	6,130	2.23198	2.83908	0.05719	5.12825
1983	2,727	3.66295	4.00346	0.12399	7.79040
1984	5,855	2.34790	1.46902	0.02738	3.84430
1985	5,485	2.22696	2.49188	0.03179	4.75063
1986	5,495	1.13061	1.07304	0.09600	2.29965
1987	4,455	1.07889	1.44217		
1988	4,493	1.46308		0.08704	
1989	4,191		1.67962	0.06531	
1990	3,294	3.14615	6.08997		
1991	2,936	6.39302		0.06815	
1992	2,095		3.07692	0.10468	
1993	4,297	1.77956	2.41267	0.08406	4.27629
1994	6,809	1.37618	3.03970	0.00283	4.41871
1995	3,456	4.32699	0.34679	0.00000	4.67378
1996	2,302	0.40142	0.65064	0.11105	1.16311
1997	4,068	0.20989	1.78593	0.13968	2.13550
1998	3,270	1.81444	3.78351		
1999	1,542	3.49463			
2000	194				
2001	5,321				
Average (Brood Years 1976-99). Outliers (in bold) excluded.					
Odd Years	3,883	2.27043	2.09946	0.07846	4.79139
Even Years	4,417	1.44814	2.45923	0.06004	2.87739
All Years	4,150	1.81817	2.27934	0.06876	3.76078
All Years 94-99	3,575	1.93726	1.92131	0.06339	3.09778
2003 PNPTC Forecast		376	2,963	207	3,546
2003 WDFW Forecast		300	3,239	199	3,738

Table A-5-n. Summary of WDFW 2003 Hood Canal Hatchery Fall Chum Forecasts

Facility	Age 3	Age 4	Age 5	Total
Little Boston Hatchery	848	1,787	119	2,754
Quilcene National Hatchery	33	5,783	241	6,057
Hoodsport Hatchery	51,455	104,000	5,346	160,801
G. Adams / McKernan Hatchery	5,940	63,685	4,731	74,356
Enetai Hatchery	300	3,239	199	3,738
12B Streams - Augmentation	0	0	8	8
12D Streams - Augmentation	0	0	20	20
Total	58,576	178,494	10,664	247,734

B. Inseason Run Assessment Methods

The fall chum salmon is the only run, among those returning to Hood Canal in 2003, for which an acceptable model for estimating abundance during the season has been found. For all other runs, inseason management approaches will be as detailed in section 4.3 of this report.

B-1. Fall Chum Salmon

Prior to November 9, when a formal inseason updated estimate of abundance will be made, the pre-season terminal run size forecast will serve as the estimate of the run entering Hood Canal. However, on October 30, there will also be an initial inseason assessment of terminal area run abundance, using the cumulative catch from purse seines in weeks 43 and 44. That estimate will only be used as initial indicator of whether the run is significantly higher, or lower than forecast and will assist the co-managers in determining the need for fishery schedule adjustments in week 45. This preliminary indicator will use the following model:

$$\text{Hood Canal Preliminary Terminal Area Run Size} = (6.5150 * CC4344) + 73013.9602$$

Data used to estimate this model are shown in Table B-1-b. Adjusted R² for this regression is 0.84196.

The final fall chum salmon run size update will be made on approximately November 6, using the cumulative catch made by purse seines, from October 19, through November 5 (three weeks). The update will be based on a linear regression model relating terminal run size to cumulative catch (treaty and non-treaty) in Area 12 based on the fisheries in the 1981 - 2002 period, excluding years in which purse seine fisheries did not operate in this area during at least the last two of the three weeks, as well as 1997. In that year, the run entry was uniquely skewed and therefore not very useful for future predictions. The update model for November 6 is as follows:

$$\text{Hood Canal Terminal Run Size} = (4.4772 * CC4345) + 32291$$

The updated run abundance entering the terminal area will represent the total abundance. The run distribution between the various production units shall be assumed to be as forecast pre-season.

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 cumulative catches by purse seines (treaty and non-treaty) from the observed years.

Table B-1-a. Summary Statistics of the Fall Chum Inseason Abundance Estimation Model

Using Data through wb 11/2	
R ²	0.9217
R ² Adjusted	0.9152
Std Error	75403.01
N	14
β ₀	32291.24
β ₁	4.4772

Table B-1-b. Inseason Fall Chum Salmon Abundance Estimation Data

Year	Terminal Run	Cum. Catch wks. 43-44	Cum. Catch wks. 43-45
1981	169,763	9,251	15,404
1982	221,740	32,541	44,777
1983	168,765	30,615	46,762
1985	400,797	33,356	
1986	498,213	71,074	128,091
1987	782,565	100,807	165,357
1988	547,105	64,150	139,587
1989	420,804	62,079	92,342
1990	288,439	44,038	56,947
1993	587,858	75,692	115,890
1994	940,107		192,329
1995	593,870		96,013
1998	570,159	110,469	136,551
1999	146,056	14,099	
2000	152,072	8,728	
2001	790,889	79,745	150,909
2002	898,754	114,540	188,517