

**2001 MANAGEMENT FRAMEWORK PLAN
AND
SALMON RUNS' STATUS
FOR THE
HOOD CANAL REGION**

**Prepared by:
Point No Point Treaty Council
(for the Port Gamble, Lower Elwha and Jamestown S'Klallam Tribes, and the Skokomish 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 Skokomish Tribe and the Lower Elwha, Port Gamble, and Jamestown S'Klallams) and was reviewed and agreed to, by the Washington Department of Fish and Wildlife (any differences between the parties are so 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 2001 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 in-season 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 2001 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), pink salmon (except for the Hoodspout Hatchery run) 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 in-season. Chinook salmon returning to area 12B tributaries are expected to be of extremely low abundance and require long term protective measures. No directed harvest is planned, prior to the fishing season, for chinook salmon in Hood Canal terminal area fisheries.

A limited treaty fishery for chinook salmon is anticipated in Areas 12C and in Area 12H where Hoodspport 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 runs of salmon, coho returning to the Quilcene Bay Pens and the Quilcene National Fish Hatchery (QNFH), coho returning to Port Gamble pens, pink salmon returning to the Hoodspport Hatchery, 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 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.

Preseason forecasts of abundance (Tables 3.1 - 3.5) are provided as a preseason guide for harvest and conservation planning. It is generally recommended that harvests be conservative prior to obtaining in-season estimates of run abundance. 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 preseason forecasts for 2001 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 2001 recruits. That rate was established at a level equal to, or higher than, the minimum escapement rate allowable for the 2001 forecasted recruitment (30%), 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' preseason planned management framework.

2. 2001 Fishery Management Periods

AREA	SPRING CHINOOK	SUMMER CHINOOK	PINK	SUMMER CHUM	COHO	E. FALL CHUM	L. FALL CHUM	WINTER STLHD
9A	---	---		---	9/2-10/13	10/14-12/1	---	12/02-3/31
12A	---	---		8/30-9/27	8/26-10/13	10/14-----	-----12/29	---
12	4/15-7/14	7/15-9/5	7/29-9/29	9/1-9/22	9/10-10/20	10/21-11/17	---	---
12B	4/15-7/14	7/15-9/13	7/29-9/29	9/5-10/01	9/13-10/20	10/21-11/17	---	---
12C	4/15-7/14	7/15-9/18	7/29-9/8	8/26-10/1	9/18-10/27	10/28-11/24	---	---
12D	4/15-7/14	7/15-9/18		8/29-9/22	9/18-10/27	10/28-11/24	---	---
Quilcene R	---	---		9/10-10/13	9/2-10/20	11/11-----	-----1/12	12/9-4/14
Dosewallips Duckabush	---	8/12-9/22	9/9-10/13	9/12-10/12	9/23-11/10	11/11-----	-----12/29	12/9-4/14
Skokomish R	5/1-8/4	8/5-9/22			9/23-11/10	11/11-----	-----12/29	12/9-4/14
Union R.	---			9/7-10/6	9/23-11/10	11/11-----	-----12/29	12/9-4/14
Misc. HC Tribs.	—	8/12-9/22	9/9-10/13	---	9/23-11/10	11/11-----	-----12/29	12/9-4/14

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 Hoodsport 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 Hoodsport 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 2001, 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. This last procedure, was 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	3,015	11,899	523	433	20,979	36,849
Canada	414	1,638	72	60	2,867	5,051
Alaska	0	0	0	0	0	0
S.Falcon Tr/Rec	3	11	1	1	20	36
N.Falcon Tr/Rec	94	373	16	14	652	1,149
P.S. Troll	16	62	3	2	108	191
SJF Rec.	75	297	13	11	521	917
Puget Sound Rec.	124	453	20	17	947	1,561
Puget Sound Net	55	216	9	8	377	665
Hood Canal Rec.	20	73	3	3	153	252
Hood Canal Net	45	178	2	7	309	541
Freshwater Rec.	230	909	0	0	0	1,139
Extreme Terminal Net	649	2,569	0	0	5,538	8,756
Mgt Unit Harvest	1,725	6,779	139	123	11,492	20,258
Mgmt Unit Escap..	1,312	5,195	384	315	9,640	16,846
Escapement Goal	1,650	1,500	750	n/a	1,850	5,750

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 for 2001, chinook 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 #1601* 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 (including commercial net, troll, marine and freshwater recreational). For further details on the methods used to estimate the above forecasts, see Appendix A-1. It is estimated that approximately 2,700 chinook, 12.4% of the run entering Puget Sound, will be harvested prior to entering Hood Canal. 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 Hoodsport 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	9,981	1,615	2,221	0	6,145	N/A
Duckabush	12,614	2,041	2,806	0	7,767	N/A
Hamma Hamma	9,981	1,615	2,221	0	6,145	N/A
Misc.	14	2	3	0	9	N/A
Hoodsport H.	7,329	1,186	1,631	24,161	4,513	1,100
Totals	39,919	6,459	8,882	24,161	24,578	

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 1999 escapement distribution. Methods used to forecast the 2001 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 Harvest	Terminal Harvest	Extreme Terminal Harvest	Expected Escapement	Minimum Escapement Threshold
Quilcene/Dabob	5,396	341	134	113	232	4,576	1,110
Mainstem HC	1,057	67	26	22	0	942	2,660
SE Hood Canal	418	26	10	16	0	365	300
Totals	6,871	434	171	151	232	5,883	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 2001 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 2001, 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 2001, 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 300 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

Management / Production Units							
Fishery	12/12B/12C/12D Skokomish		9A	12A	Subtotals		Total
	Natural	Hatchery	Aggregate ₍₃₎	Aggregate ₍₃₎	Hatchery & SecNat'l	Natural	
Recruits	56,163	10,517	9,741	20,135	40,393	56,163	96,556
Canada	446	77	72	153	302	446	748
S.Falcon Tr/Rec	58	20	18	31	69	58	127
N.Falcon Tr/Rec	4,955	1,479	1,262	2,361	5,102	4,955	10,057
P.S. Troll	65	11	10	22	43	65	108
Strait Rec.	4,667	1,243	1,077	2,066	4,386	4,667	9,053
SJI Rec.	141	56	47	82	185	141	326
Area 9 Rec.	1,793	306	286	614	1,206	1,793	2,999
S. Sound Rec.	1,248	213	199	427	839	1,248	2,087
Strait Net	857	144	135	291	570	857	1,427
SJI Net	248	91	76	135	302	248	550
No. Sound Net	175	30	28	59	117	175	292
So. Sound Net	1,230	205	193	416	814	1,230	2,044
Hood Canal Rec.	516	88	82	177	347	516	863
HC Rivers Rec.	400	171	0	330	496	400	901
HC Mainstem Net	4,168	696	654	1,411	2,761	4,168	6,929
Area 9A Net ⁽¹⁾	1,195	214	4,446	186	4,896	1,195	6,091
Area 12A Net ⁽²⁾	39	43	1	2,658	2,703	39	2,742
Skokomish R Net	3,198	1,636	0	0	1,636	3,198	4,834
Mgt Unit Harvest	25,399	6,723	8,586	11,419	26,774	25,399	52,173
Mgt Unit Escap.	30,764	3,794	1,155	8,716	13,619	30,764	44,383
Min. Escap. Goal	19,657	550	200	2,400	3,150	16,849	19,999

Notes: (1) The “9A Net” harvest will also include 459 coho salmon from “non-local” management/production units which are not shown in the above table.

(2) The proportion of “natural” coho in these fisheries was estimated separately, through cohort reconstruction, therefore it is not in agreement with Puget Sound run reconstruction figures, published elsewhere.

(3) 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 normal-timed coho salmon runs returning to Hood Canal consist of several small natural components in all river systems, and 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.

The aggregate (natural and hatchery) Hood Canal run of Age-2 recruits was forecast to be 127,302, consisting of 82,688 natural (74,047 primary and 8,641 secondary) and 44,614 hatchery coho. For 2001, the PNPTC Tribes and the WDFW jointly agreed to adjust each agency's pre-season forecast by its long term mean absolute percent error (MAPE). The mean of the resulting range was 82,688 DA-2 and this was used to provide model input values for the 2001 PFMC/North of Falcon management planning process. The methods used to develop the 2001 Point No Point Treaty Council (PNPTC) Hood Canal coho forecasts are further detailed in Appendix A-4 of this report.

Table 3.4 is based on the results of the preseason *FRAM* simulation #0119, and does not include estimated natural mortality in 2001. 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 #0119 and its associated Terminal Area Modules (TAMM). Further details concerning preseason 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 (in all fisheries) of 65%, based on this year's predicted abundance. The expected escapements are those which would result after the application of the preseason established fishing regimes, to the 2001 forecasted abundance.

The escapement targets for hatchery (and secondary natural) management units are those necessary to meet the parties' agreed-upon enhanced production per the 1989 Hood Canal Production Evaluation MOU, as adjusted for 2001 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 Hoodsport 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 Hoodsport run, as well as similarly timed hatchery units (Enetai and QNFH). In practice, during the early fall chum management period, only the Hoodsport/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 2001 forecasts of all fall chum salmon returning to Hood Canal are described in Appendix A-5 of this report. Because of unusual and unanticipated delays in processing source data, the final forecasts for this season were prepared during the last part of September and early October. Given this, unresolved methodological differences between the PNPTC and WDFW forecasts remain, and both versions are presented below.

Pre-terminal catches are expected to occur exclusively during Treaty 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 3,100 at the Strait of Juan de Fuca (SJF) and 0 at the San Juan Islands (SJI). This is assuming the preseason forecasted catch level of 10,450 chum salmon in the Strait, and the expectation of no fishery in the San Juans, given the low forecast of British Columbia “clockwork” runs. 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 1998-2000 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 Hoodport Hatchery versus the George Adams/McKernan Hatchery complex, is based on the management objectives of meeting the combined Hoodport/Skokomish River hatchery escapement, plus providing a minimal in-river fishery, in the Skokomish River.

The expected escapement to the Little Boston Hatchery assumes a 95% 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 Hoodport-George Adams-McKernan surplus. For late-fall chum, the expected escapements are those that would result after Hoodport-timed chum have been taken from the portion of each late-fall management unit that overlaps the Hoodport 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, the goals form a management guideline for secondary management unit protection.

3.5.1 Fall Chum Salmon Summary (PNPTC Approach)

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	3,310	46	3,264	2,134	1,017	113	0
<i>AREA 12</i>							
Natural-Augmented	2,005	28	1,977	1,293	0	684	3,900
<i>AREA 12A</i>							
Natural	2,322	32	2,290	494	0	1,796	1,250
Hatchery	13,320	183	13,137	4,723	0	8,414	3,100
<i>AREA 12B</i>							
Natural-Augmented	33,213	457	32,756	7,108	0	25,648	18,750
<i>AREA 12C</i>							
Natural-Augmented	9,816	135	9,681	6,329	0	3,352	7,000
Hoodsport Hatchery	73,209	1,007	72,202	47,202	15,000	10,000	10,000
Enetai Hatchery	11,434	157	11,277	4,718	0	6,559	1,900
<i>AREAS 82 G/J (Skokomish R.)</i>							
Natural	7,240	100	7,140	2,801	346	3,993	9,800
G.Adams-McKernan Hat	57,279	788	56,491	36,931	4,560	15,000	15,000
<i>AREA 12D</i>							
Natural-Augmented	13,076	180	12,896	8,431	0	4,465	13,550
Totals	226,224	3,113	223,111	122,164	20,923	80,024	84,250

3.5.2 Fall Chum Salmon Summary (WDFW Approach)

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	2,527	21	2,506	2,011	446	49	0
<i>AREA 12</i>							
Natural-Augmented	2,788	23	2,765	2,218	0	547	3,900
<i>AREA 12A</i>							
Natural	5,731	48	5,683	1,505	0	4,178	1,250
Hatchery	6,794	57	6,737	2,423	0	4,314	3,100
<i>AREA 12B</i>							
Natural-Augmented	54,236	452	53,784	14,264	0	39,520	18,750
<i>AREA 12C</i>							
Natural-Augmented	12,711	106	12,605	10,114	0	2,491	7,000
Hoodsport Hatchery	153,103	1,276	151,827	121,827	20,000	10,000	10,000
Enetai Hatchery	12,074	101	11,973	6,149	0	5,824	1,900
<i>AREAS 82G/J (Skokomish R.)</i>							
Natural	10,504	88	10,416	5,015	266	5,135	9,800
G.Adams-McKernan Hatchery	97,519	812	96,707	77,598	4,109	15,000	15,000
<i>AREA 12D</i>							
Natural-Augmented	15,676	131	15,545	12,474	0	3,071	13,550
Totals	373,663	3,113	370,550	255,598	24,821	90,129	84,250

4. Pre-Season Management Framework

4.1 2001 Harvest Management Measures and Expected Fisheries

In 2001, 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 3,350 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 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 Hoodsport Hatchery. In order to provide necessary protection to the Mid-Canal unit, as well as provide both fishing opportunity and protection to Skokomish chinook, chinook fisheries will only be implemented in Area 12C and in the Hoodsport 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.

In 2001, the anticipated return of pink salmon, originating from natural rearing areas (Dosewallips, Duckabush and Hamma Hamma) are expected to be quite low. Therefore the only run of sufficient abundance to sustain fisheries shall be the Hoodsport Hatchery run. In order to provide protection to natural runs, the only harvest of pink salmon will be limited to Areas 12C and 12H.

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 stocks were pursued during the 2001 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 2001. The BCR is based on a series of management measures, which are expected to effectively reduce incidental impact to the summer chum 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 2001, early-fall chum runs managed at rates appropriate for the George Adams/McKernan, Hoodsport, and Little Boston hatcheries are expected to comprise most of the total fall chum return. Therefore, significant harvests are expected during the early-fall chum management period.

4.1.1 Commercial Fisheries

All commercial fishery openings, restrictions, and closures outlined, are those which were scheduled 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, then 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 2001 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 2001, from July 22 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 through August 18 and up to 6 days a week thereafter. Additional fisheries may also be implemented in Area 12H, as necessary to harvest surpluses, from July 29 through September 1. 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 preseason measures may be modified on the basis of in-season information.

During the coho management period, in Area 12, gillnets may operate after September 24 through October 20. Beach seines may start September 16 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 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.

Area 12C gillnet fisheries for coho salmon have been initially planned to operate up to 5 days/week through October 13. During coho salmon fisheries, the area within 500' from the western shore of Areas 12B and 12C, 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.

During the fall chum management period, commercial fisheries in Areas 12 and 12B will start on October 21, followed by the opening of Area 12C (October 28). 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 17 (Areas 12 and 12B), and November 24 (Area 12C).

A hook and line Treaty Indian fishery may be implemented from October 28 through December 8 in Area 12H. In addition to the mainstem set, drift gillnet and beach seine fisheries for early fall chum salmon, Treaty Indian beach seine fisheries may be authorized for up to two days per week in Area 12H (after November 3 and through December 8) if inseason information indicates an otherwise unharvestable surplus. The Hoodsport 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 the closure zone.

A non-treaty fishery for coho and chum salmon have been authorized for one day in Area 12, during the week of October 14. Non-treaty fisheries for fall chum in Areas 12 and 12B will start on October 21.

In Areas 12 and 12B, fisheries are anticipated to occur initially (first 2 weeks) for 1 day per week and, depending on in-season management considerations, for 2 days for the next week and one day in the fourth week, ending no later than November 17. Fisheries in Area 12C may follow, as necessary, after November 10, ending no later than the week of November 24. 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 and chinook, 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 09/29, no commercial net fisheries are anticipated in 2001 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. 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 September 1, 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 1. Non-treaty coho fisheries (gillnet only) in this area shall operate inside Port Gamble Bay, continuously, from September 16 through October 27, and shall be required to release all chum salmon through 9/30.

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 2001. 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 2001. This program has been developed cooperatively by PNPTC, WDFW, and USFWS. These agencies have also agreed that fisheries in Area 12A shall be closely monitored through the season, by obtaining all the information that would be needed to assess the effectiveness of preseason 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. If brood stock collection crews are not available, all live chum salmon shall be released unharmed and any mortalities shall be reported to agency personnel. Any chum salmon retrieved dead, by Treaty fishers, shall be kept and recorded on fish receiving tickets, in order to facilitate their being accounted for.

In Area 12A, during the coho salmon management period, and extending into the fall chum salmon period, treaty and non-treaty fisheries will generally be limited to beach seine and hook-and-line gear, opened daytime hours from August 26, through October 13, on a Monday through Friday schedule. The fishing area will be restricted to the area north of an east-west line through Point Whitney, in order to minimize the possibility of impact to milling Dosewallips River summer chum and chinook salmon. In addition to the above, treaty Indian gillnet fisheries may be implemented, starting the week of September 1, and limited to one day/week through September 30. The gill net fishery will be monitored during the season to evaluate harvest of hatchery coho and incidental chum salmon catch. 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)

In the Skokomish River (Area 82G), during the chinook salmon management period, fisheries may open from 7/29 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.

During the coho salmon management period, fisheries may start in the week of September 23, and may proceed on a 2-5 days-per-week schedule through the remainder of the coho salmon management period. During the first week of the coho season, the area downstream of SR 106 shall remain closed to gillnet gear.

During the fall chum salmon management period, fisheries of approximately 4-7 days per week may be authorized starting the week of November 11. At the end of the early-fall chum salmon fishery (after December 8), 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 9.

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. From 9/2 through 10/6, fisheries using hand held gear (dip nets, hand lines, etc.) may be allowed for the harvest of surplus coho salmon in areas upstream from Rogers Street. No commercial net fisheries will be authorized in any of the other Hood Canal streams in 2001.

4.1.2 Test and Evaluation Fisheries

In 2001, no test fisheries are anticipated in any Hood Canal marine or freshwater areas.

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 continue to be closed through August 31, then will open with a 4 fish limit (coho only) through September 30. From July 1 through September 30, 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 1 through October 15 the entire area shall be open with a four (coho only) salmon bag limit.

From October 16 through November 30, the bag limit shall be two fish, with no retention of chinook salmon. Area 12 will be closed to the taking of salmon, from December 1 through February 28, 2002. From March 1 through March 31 the area will be open with a one fish possession limit (chinook 22" min size). From April 1 through April 30, 2002 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 November 30 the limit shall be 2 fish with no retention of chinook salmon. 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), up to 2 chinook salmon (>24" min size) may be retained, with a the 4 salmon bag limit, from July 1 through December 15, 2000. Chum salmon may not be retained from 7/1 through 10/15. The Area 12H fishery shall be limited to daytime use only. 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, 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 up to two fish may be adult chinook and 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. 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 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 preseason 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, designed to provide for in-season reassessment of the 2000 management plan and management measures, 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 specific activities are recommended:

During the coho fisheries in Areas 12 and 12B, from late September, through mid October, chum salmon tissue samples should be taken (up to 200 per week). Prior to October 11, this information will be used to attempt to distinguish the proportions of summer vs. fall chum salmon in the coho fishery bycatch. During this period, it is also recommended that the collection of additional GSI and DNA tissue samples, from chum salmon, be actively pursued using a purse seine test fishery in the Hood Canal mainstem. After October 11, any further sampling would be part of a continuing annual series whose goal is to assess the stock composition of the Hood Canal chum fisheries, with the specific objective being to assess the contribution of non-Hood Canal origin fall chum salmon, and their individual region of origin. At the same time, scale samples should be collected, in order to maintain a long data series on brood year survival and fishery contributions.

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.

Emphasis should be placed on the recovery of coded-wire tags from chinook and coho salmon in Hood Canal fisheries which are crucial to annual escapement, survival rate estimation and run reconstruction.

4.3 Inseason Run Size Updates

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

In the Quilcene area, in-river escapement estimates for coho and summer chum salmon shall be used in-season 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 in-season updates of run abundance, as described in Appendix B. For all other species and runs, the preseason forecasts, as outlined in this report, will serve as estimates of abundance throughout the year.

APPENDIX

A. Preseason Forecasting Methods

B. Inseason Run Assessment Methods

A. Preseason Forecasting Methods

A-1. Summer/Fall Chinook Salmon

The 2001 forecast of summer-run Hood Canal chinook salmon is the product of brood 1997 fingerling lbs released from WDFW facilities, multiplied by the average of post-season estimated terminal area return rates (terminal run / fingerling lbs released 3 yrs previous) for the last five return years (1996-2000), which are believed to represent current survival rates. The terminal area forecast was expanded to the "Area 4B" run using the mean of the 1996-99 post-season estimated proportion (0.99196). The resulting terminal area run forecast is 25,173 chinook salmon, and the Area 4B forecast is 25,377. The Hood Canal Area 4B forecast of 25,377 was apportioned to 22,637 hatchery fish (32.4% George Adams and 56.7% Hoodspport hatchery) and 2,740 (10.8%) natural fish based on the Puget Sound run reconstruction-based relative contribution of individual Hood Canal management units in the 1996-2000 return years. These estimates were used as inputs to generate ocean recruit forecasts during preseason simulation modeling.

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

Return Year (RY)	0+ Lbs. Released in RY-3	Return/Lb	Terminal Run	4B Run	Term/4B
1984	39,232	0.42295	16,593	17,252	0.96180
1985	40,098	0.50574	20,279	21,059	0.96296
1986	55,499	0.39329	21,827	22,874	0.95423
1987	50,811	0.51412	26,123	27,282	0.95752
1988	55,967	0.50753	28,405	29,771	0.95412
1989	65,510	0.38222	25,039	25,532	0.98069
1990	54,674	0.23280	12,728	12,865	0.98935
1991	100,366	0.18881	18,950	19,263	0.98375
1992	101,102	0.02929	2,961	2,997	0.98799
1993	89,517	0.05293	4,738	4,812	0.98462
1994	78,335	0.04785	3,748	3,849	0.97376
1995	82,895	0.11068	9,175	9,401	0.97596
1996	73,472	0.11065	8,130	8,166	0.99559
1997	32,571	0.23963	7,805	7,929	0.98436
1998	58,652	0.27938	16,386	16,479	0.99436
1999	89,149	0.32935	29,361	29,552	0.99354
2000	87,306	0.27991	24,438		
2001*	101,591				
Average 1996-2000		0.24778	Average 1996-1999		0.99196
2001 Forecast			25,173	25,377	

(*) : 2001 data are preliminary and subject to revision.

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	1,413	5,949	8,358	16,386
1999	0	900	112	376	2,637	11,939	13,397	29,361
2000*	0	438	237	189	1,134	5,424	16,256	23,678

Note: The 2000 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
1996	0.00098	0.00295	0.00012	0.00012	0.12239	0.38130	0.49213
1997	0.00346	0.00077	0.00192	0.00090	0.05791	0.24177	0.69327
1998	0.00269	0.01752	0.00903	0.01141	0.08623	0.36305	0.51007
1999	0.00000	0.03065	0.00381	0.01281	0.08981	0.40663	0.45629
2000	0.00000	0.01850	0.01001	0.00798	0.04789	0.22907	0.68654
'96 - 2000 Mean	0.00143	0.01408	0.00498	0.00664	0.08085	0.32437	0.56766

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

Hood Canal Production Unit	4B Run Forecast	Proportion
12B	362	0.01427
12C	128	0.00505
12D	171	0.00673
Skokomish	2,079	0.08193
Natural Subtotal	2,740	0.10797
George Adams	8,231	0.32437
Hoodsport	14,405	0.56766
Hatchery Subtotal	22,637	0.89203
Total	25,377	1.00000

Note: The forecasted proportions are derived from the 1996-2000 mean return.

A-2. Pink salmon.

A-2.1 Natural Runs

The 2001 return of naturally reared Hood Canal pink salmon was forecast as recruitment to all fisheries and escapement, using the product of the 1999 brood year estimated escapement (9,479) (Table A-2-a) multiplied by the average estimated "Cycle 3" return rate of (3.438) for a natural forecast of 32,589 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 Natural 4B Run	Hood Canal Total Natural Recruits	Hoodsport Hatchery Recruits	Hood Canal Total Recruits
1959	30,600	30,600	35,386	49,421	2,471	51,892
1961	36,900	36,900	40,902	47,951	3,833	51,784
1963	503,200	503,200	837,737	1,200,196	15,837	1,216,033
1965	160,500	160,500	178,142	226,069	606	226,675
1967	269,400	271,100	311,576	493,000	4,092	497,092
1969	42,100	42,100	43,591	59,714	3,206	62,920
1971	104,100	104,100	110,208	143,875	3,303	147,178
1973	47,100	47,200	53,877	76,748	2,455	79,203
1975	12,600	12,600	14,334	20,047	3,739	23,786
1977	44,300	44,300	46,364	76,762	10,067	86,829
1979	37,300	37,400	43,044	84,235	9,797	94,032
1981	6,550	7,150	7,733	13,639	3,395	17,034
1983	25,200	25,400	26,001	29,247	622	29,869
1985	64,100	66,200	68,563	90,812	2,167	92,979
1987	62,200	64,000	69,210	77,417	11,092	88,509
1989	60,970	80,100	93,542	130,646	4,583	145,961
1991	118,450	118,487	143,141	180,734	5,037	186,862
1993	35,406	35,406	38,730	40,093	13,025	53,118
1995	31,306	31,306	32,268	39,531	32,102	71,633
1997	8,363	8,363	9,189	14,684	37,738	52,422
1999	9,479	9,479	9,513	9,600	7,715	17,315

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	
Average:	2.045		0.618		3.438
Std. Dev.	1.209		0.439		1.955
2001 Forecast Recruits					32,589

A-2.2 Hatchery runs.

The 2001 return of hatchery reared Hood Canal pink salmon was forecast as recruitment to all fisheries and escapement, using the product of the 1999 brood year fingerling pounds released from the Hoodsport hatchery (3,117), multiplied by the long term average recruits per pound rate estimated for the Hoodsport hatchery (2.3514). The resulting recruit forecast is 7,329 pink salmon recruits (Table A-2-c).

Table A-2-c. Hoodspport 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	7,715	0.9827
1999	3,117	7,617	2.4437
BY 1959-97 Average			2.3514
2001 Forecast		7,329	

A-3. Summer Chum Salmon

A-3.1 Natural Runs

The 2001 forecast of the Hood Canal natural summer-timed chum salmon returns was forecast as total recruitment to 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 1,057 for the Mainstem and 418 for the SE Hood Canal units, for a total of 1,475. Additionally, summer chum salmon are expected to return to Big Beef Creek and John Creek (Hamma Hamma) (Mainstem unit) from an 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 5,396. 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	5,554	716	25,061
1979	7,844	734	817	9,395
1980	8,868	1,932	2,134	12,934
1981	4,334	761	477	5,572
1982	5,525	1,495	956	7,976
1983	544	2,348	597	3,489
1984	1,279	1,486	502	3,267
1985	1,768	1,026	1,420	4,214
1986	1,284	1,482	5,001	7,767
1987	150	2,721	1,030	3,901
1988	2,191	2,537	915	5,643
1989	615	1,597	2,187	4,399
1990	260	606	580	1,446
1991	702	1,153	321	2,176
1992	1,942	1,236	183	3,361
1993	397	183	284	864
1994	1,164	894	892	2,950
1995	4,394	4,822	760	9,976
1996	10,758	9,792	511	21,061
1997	680	8,199	493	9,372
1998	758	3,202	255	4,215
1999	779	3,554	174	4,507
2000*	2,012	6,628	749	9,389
2001 Forecast ('97-'00 Mean)	1,057	5,396	418	6,871

* 2000 Data is preliminary and subject to revision.

A-4. Coho Salmon

A-4.1 Natural Runs

A-4.1.1 PNPTC Forecast

The forecast of Hood Canal natural runs was expressed in units of December Age-2 recruits, using a recent years' historical relationship between total emigrating smolts from Big Beef Creek (BBC) and the following year's total Hood Canal natural coho recruit volume (as estimated through cohort reconstruction, using coded wire tag data (CWT)). Hood Canal terminal catch and escapement were reconstructed using the RRTERM program which utilizes CWT data where available. The annual abundance of December Age-2 recruits was estimated as the sum of the third year mortalities plus escapement. Age-3 recruits (Ocean Recruits) are predicted by multiplying the December Age-2 recruits by 0.75, in order to obtain recruits to fisheries plus escapement in the third year of life.

For 2001, the following forecasting method and data were used:

$$HC_{R2001} = BBC_{Sm00} * \frac{HC_{Sm96-98}}{BBC_{Sm96-98}} * \frac{HC_{R97-99}}{HC_{Sm96-98}}$$

$$HC_{R2001} = BBC_{Sm00} * \frac{HC_{R97-99}}{BBC_{Sm96-98}}$$

Where: HC_R = Total Hood Canal Recruits
 HC_{Sm} = Total Hood Canal Smolts
 BBC_{Sm} = Total Big Beef Creek Smolts

In the above, the forecasted recruitment is estimated as the product of Big Beef Creek emigrating smolts, times a recent years' average expansion factor to obtain the Hood Canal total smolts, times recent years marine survival, estimated as recruit/smolt ratio.

The 1997-99 period of recruitment was used, because it comprises the latest available generation cycle (3 years), for this region and is believed to reflect the most recent, available, freshwater and marine survival conditions. Data used in the above calculations are found where indicated in Table A-4-a below.

The forecast generated by the above method was hindcast to the years for which a post-season estimate of recruit abundance are available (Table A-4-a).

Table A-4-a. 2001 Hood Canal Natural Coho Forecast Data

Brood Year	Big Beef Crk Smolts (Tagged and Untagged)	Hood Canal Total Dec Age-2 Recruits	HC Recruits per BBC Smolt
1975	35,025		
1976	17,619		
1977	45,634		
1978	20,715		
1979	41,054		
1980	25,225		
1981	25,333		
1982	36,636		
1983	25,720	211,127	8.2087
1984	24,479	232,860	9.5126
1985	11,510	40,236	3.4957
1986	26,534	117,460	4.4268
1987	17,594	118,316	6.7248
1988	19,565	70,422	3.5994
1989	23,646	61,949	2.6199
1990	18,677	64,929	3.4764
1991	13,071	138,845	10.6224
1992	18,431	94,029	5.1017
1993	16,201	71,422	4.4085
1994	25,531	145,541	5.7006
1995	36,262	178,653	4.9267
1996	20,525	23,707	1.1550
1997	20,967		
1998	47,089		
2001 PNPTC Forecasts			
'90,92-96 Mean	22,605		4.1282
BY '94-96 Mean	27,439		3.9274
2001 December Age-2 Forecast		184,939	

A-4.1.2 WDFW Forecast

For Hood Canal, adult coho recruits were estimated as the product of smolt production and marine survival. The pre-season forecast (PSF) was expressed as age 3 ocean recruits and was “backed up” to estimate December Age-2 (DA-2) recruits.

Natural smolt production: In spring, 2000, WDFW trapped four streams on the east side of Hood Canal and captured a total of 54,568 coho smolts comprised of 47,089, 6143, 1292, and 44 smolts in Big Beef, Stavis, Seabeck, and Little Anderson creeks, respectively. Table 3 of the Hood Canal Joint Technical Committee (HCJTC) report on MSH Escapement Estimates (PNPTC et al. 1994), provides estimates of coho summer rearing area, MSH smolts, and MSH escapement levels for Hood Canal, under average summer low flow conditions. The four Hood Canal streams trapped during 2000 comprise about 7.5% of the total Hood Canal MSH smolt production. Thus, the estimate of total smolt production in Hood Canal in 2000 (see Table A-4-b) was calculated as:

$$(54,568 \text{ smolts trapped}) / (0.075485 \text{ proportion of total}) = 722,900 \text{ natural coho smolts.}$$

Table A-4-b. Actual number of natural coho smolts trapped in four streams in Hood Canal and the estimated total wild coho smolt production in Hood Canal, 2000.

Stream	MSH smolts a/	Actual smolts in 2000
Big Beef Creek	29,643	47,089
Stavis Creek	3,144	6,143
Seabeck Creek	6,565	1,292
Little Anderson Creek	<u>3,190</u>	<u>44</u>
Sub-total	42,542	54,568
Total Hood Canal	563,704 b/	----
Proportion of Hood Canal total MSH smolts in streams trapped during 2000 (Sub-total / Total)	0.075485	----
Estimated total smolts in Hood Canal in 2000 c/	----	722,900

a/ from Table 3 of HCJTC report, under average summer low flow conditions

b/ derived from Table 3 and other data in HCJTC report, where “tribs” are streams < 5.5 meters wide and “mainstems” are streams > 5.5 meters wide

“Tribs” MSH smolts = 301,847

Total MSH spawners (“tribs” + “mainstems”) = 23,965

“Tribs” MSH spawners = (301,847 smolts) / (23.522 smolts/spawner) = 12,833

“Mainstems” MSH spawners = (23,965 total) - (12,833 “tribs”) = 11,132

“Mainstems” MSH smolts = (11,132 MSH spawners) x (23.522 smolts/spawner) = 261,847

Total MSH smolts (“tribs” + “mainstems”) = 563,704

c/ Estimated Hood Canal smolts in 2000 = (54,568 actual smolts in 2000) / (proportion of Hood Canal total MSH smolts in streams trapped in 2000)

The estimate of 722,900 total natural BY 1998 coho smolts in Hood Canal during 2000 was larger than the total MSH smolt estimate of 563,704 in the HCJTC report. The HCJTC report estimate was based on

average summer low flow conditions and “average” MSH seeding. The Puget Sound summer low flow index for BY 1998 was the third highest on record since 1980 which would indicate relatively high production of coho for BY 1998. In addition, Big Beef Creek produced a record high number of coho smolts in 2000, more evidence that coho smolt production was likely well above average overall in Hood Canal streams. Spawner escapement was 99,700 natural coho for BY 1998, well above the “average” MSH escapement range of 16,010 - 30,305 adults in the HCJTC report. Distribution of spawning was good throughout Hood Canal for BY 1998 (escapement was apportioned as 40,323, 44,420, and 14,957 adults to Areas 12/12B, 12C/12D, and Skokomish River, respectively), so most available habitat was likely adequately seeded. The combination of relatively high escapement, good distribution of spawners throughout Hood Canal, and relatively high summer low flows contributed to the relatively high production of smolts for BY 1998.

Marine survival: The estimate of marine survival for BY 1998 coho smolts which emigrated from Hood Canal streams in 2000 is based on historical data collected for Big Beef Creek natural coho. As reported in the WDFW 2001 forecast report (D. Seiler, memo 01-03-01), “correlating jack returns to Big Beef Creek with same-brood survival-to-adults indicates a strong relationship”. Data used to develop the correlation between marine survival (year i+3) and jack return rate (year i+2) for Big Beef Creek natural coho for brood years (year i) 1977 through 1997 are shown in Table A-4-c. The correlation between marine survival (Y) and jack return rate to Big Beef Creek (X) was described by the equation:

$$Y = 11.0486X + 0, \text{ with } R^2 = 0.725$$

Marine survival was calculated from (1) the estimated (adjusted) number of coded-wire tagged coho released at Big Beef Creek and (2) the number of CWTs recovered in all fisheries and at the rack at Big Beef Creek as reported in the coastwide CWT database. Coded-wire tagging has an impact on survival of wild coho smolts, so the actual number of coded-wire tagged coho smolts released was adjusted for (a) an estimated 16% mortality induced by the tagging procedures as determined during three years of WDFW research studies at Minter Creek Hatchery (publication available upon request) and (b) tag loss estimated for each release.

Using the predictive equation, the tagged wild jack return rate, to the counting fence, in 2000 of 0.56% (178 jacks from 31,632 smolts tagged in 2000), predicts an adult marine survival rate of 6.2%.

2001 Natural Coho Forecast: The WDFW 2001 pre-season forecast for natural coho in Hood Canal was calculated as:

$$(722,900 \text{ Hood Canal smolts}) \times (6.2\% \text{ survival-to-age 3}) = 44,820 \text{ age 3 recruits};$$

and

$$(44,820 \text{ age 3 recruits}) \times (1.333 \text{ DA-2 recruit / age 3 recruit}) = 59,760 \text{ Dec-Age 2 recruits}$$

Table A-4-c. Number of wild smolts tagged, wild jack return, and adult marine survival for Big Beef Creek wild coho, brood years 1975 through 1998.

Brood Year (i)	SMOLTS (i+2)		JACKS (i+2)		ADULTS (i + 3)		
	Smolt Year	Number Tagged	Wild Tag Returns @ BBC	% Return	Return Year	Est. Tags (Harv+Esc)	Marine Survival
1975	1977	24,158	not available		1978	3,199	13.24%
1976	1978	12,782	38	0.30%	1979	2,128	16.65%
1977	1979	28,254	565	2.00%	1980	8,215	29.08%
1978	1980	16,271	270	1.66%	1981	2,761	16.97%
1979	1981	32,296	404	1.25%	1982	4,734	14.66%
1980	1982	18,379	not available		1983	3,974	21.62%
1981	1983	16,144	217	1.34%	1984	2,819	17.46%
1982	1984	24,984	577	2.31%	1985	5,578	22.33%
1983	1985	16,923	366	2.16%	1986	5,445	32.18%
1984	1986	16,123	370	2.29%	1987	4,636	28.75%
1985	1987	8,132	126	1.55%	1988	898	11.04%
1986	1988	13655	217	1.59%	1989	2,448	17.93%
1987	1989	11707	243	2.08%	1990	2,640	22.55%
1988	1990	14135	123	0.87%	1991	1,389	9.83%
1989	1991	17055	150	0.88%	1992	1,549	9.08%
1990	1992	13645	224	1.64%	1993	1,240	9.09%
1991	1993	8966	154	1.72%	1994	2,133	23.79%
1992	1994	13358	164	1.23%	1995	1,471	11.01%
1993	1995	12214	189	1.55%	1996	1,624	13.30%
1994	1996	18030	303	1.68%	1997	3,075	17.05%
1995	1997	29241	525	1.80%	1998	4,743	16.22%
1996	1998	16,551	45	0.27%	1999	510	3.08%
1997	1999	16287	85	0.52%	2000	n/a	
1998	2000	31632	178	0.56%	2001	n/a	
1999	2001	0	0		2002		
2000	2002	0	0		2003		

A-4.1.3 Joint PNPTC / WDFW Forecast

For 2001, PNPTC Tribes and WDFW jointly agreed to adjust pre-season forecasts by the mean absolute long-term error estimated for each forecast method. The tribes and WDFW calculated the error associated with each PSF. Each PSF method was applied to the data from the 1983 through 1996 brood years and forecasts for each year were compared to the “actual” recruits. For this exercise, in the absence of alternative data, DA-2 recruits from run reconstruction (Table A-4-a) were used as the “actual” recruits.

The average error (mean absolute error) of the PNPTC forecast was ~ 50% for the 1987 through 1996 brood years, ranging from 3 - 86%. The average error (mean absolute error) of the WDFW forecast was ~ 22% for the 1983 through 1996 brood years, ranging from 1 - 55%. The PNPTC forecast of 184,939 DA-2 was decreased by the estimated mean long-term error of 50% and the recommended PNPTC 2001 forecast is 92,470 DA-2. The WDFW forecast of 59,760 DA-2 was increased by the mean long-term error of 22% and the recommended WDFW 2001 forecast is 72,907 DA-2s.

For simulation modeling and planning purposes during 2001, the jointly recommended Hood Canal natural coho PSF is between 72,907 and 92,470 DA-2. The mid-point of the recommended range is 82,688 DA-2 and was the final forecast used for 2001 pre-season planning.

A-4.1.4 Distribution of the Natural Runs

Natural runs from all Hood Canal units except 9A and 12A are classified as Primary Management Units. Natural runs from areas 9A and 12A, as well as all hatchery units, are designated as Secondary. The total forecast of 82,688 natural December Age-2 recruits was apportioned into 74,047 from primary units and 8,641 from secondary units. This is based on the proportion of escapement capacity (MSH Spawners HCJTC Report Table 3) of BY 1998; for 89.55% in the primary management units and 10.45% in the secondary management units (Table A-4-b). This forecast does not include any coho produced in streams north of the latitude of Foulweather Bluff (*i.e.*, it does not include "Area 9 Independents" which are included in the Strait of Juan de Fuca forecasts).

Table A-4-d. Apportionment of the 2001 Hood Canal Natural Coho Forecast

Area	Mean Escapement BY 1998	Management Unit Type	Proportion of Escapement Capacity	December Age-2 Recruits
12 / 12B	40,323	Primary	28.88%	23,880
12C / 12D	44,420	Primary	31.66%	26,179
Skokomish	14,957	Primary	29.01%	23,988
9A / 12A	1,028	Secondary	10.45%	8,641
Primary Subtotal	99,700		89.55%	74,047
Secondary Subtotal	1028		10.45%	8,641
Grand Total	100,728		100.00%	82,688

A-4.2 Hatchery Runs

The 2001 forecast, utilized survival rates from the 1994 through 1996 period of broods (Table A-4-e). 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-e).

The 2001 forecast of 44,614 hatchery reared December Age-2 coho recruits (Table A-4-f) was predicted from brood year 1998 smolt releases multiplied by the average estimated marine survival rate for each facility's smolts from the three latest available brood years. In most cases, this meant brood years 1994-1996. In the case of the Quilcene Bay pens, the brood years used are 1993, 1995 and 1996 because there were no releases from brood year 1994 (Table A-4-e).

Table A-4-e. 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	<i>16,075</i>	<i>0.08307</i>	
1987	298,000	28,068	0.09419	407,600	157,116	0.38547	753,390	75,121	0.09971	146,000	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				
1995	434,140	6,963	0.01604	342,828	8,450	0.02465	425,971	17,648	0.04143	220,000	5,756	0.02616	
1996	527,317	11,860	0.02249	441,656	18,864	0.04271	452,203	9,978	0.02207	225,269	2,780	0.01234	
1997	534,554			103,516			437,222			190,006			
1998	502,266			391,765			368,399			208,000			
Average (1991-96)			0.05070				0.05051				0.06786		
	'94-'96	13,866	0.02761	'94-'96	11,811	0.03015	'94-'96	15,671	0.04254	'93,'96	3,266	0.01570	

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

Table A-4-f. Hood Canal Hatchery Coho Forecast

Facility	Three Year Average R/Sm	BY '98 Smolts Released	Dec-2 Recruits
G. Adams (Purdy Creek)	0.02761	502,266	13,866
Port Gamble Net Pens	0.03015	391,765	11,811
Quilcene National FH	0.04254	368,399	15,671
Quilcene Net Pens	0.01570	208,000	3,266
Totals:		1,470,430	44,614

A-5. Fall Chum Salmon

The 2001 forecast of the Hood Canal fall chum salmon run was estimated separately for natural production units, off-station augmented production in natural rearing areas, and individual hatchery production units. The following descriptions of methods and source data are intended to provide documentation of the methods and approaches used.

A-5.1 Natural Runs

A-5.1.1 PNPTC Forecasting Approach

The 2001 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 1994-1997. The mean recruit-per-spawner return rates were 0.34266, 0.49824, and 0.02205 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 trend of lower survival. The average rates of return were multiplied with the 1998, 1997, and 1996 brood escapements (101,631; 53,492; and 251,803, respectively) to estimate the total 2001 forecast of 67,028 Hood Canal natural fall chum returning to Area 4B.

The Hood Canal natural run forecast was further apportioned to individual production units (Tables A-5-b and A-5-c), 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 in stream enhancement and supplementation efforts. The forecast of this latter component is described under "Hatchery runs" (Section A-5.2).

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	47,801	0.58853	1.63843	0.09530	2.32226
1969	30,070	0.55347	1.14769	0.09264	1.79380
1970	41,699	0.55972	1.58097	0.01314	2.15383
1971	41,138	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	52,223	0.81058	4.42767	0.07083	5.30908
1975	16,265	7.39128	0.05031	0.00000	7.44159
1976	48,079	0.53106	0.21013	0.03284	0.77403
1977	26,074	2.64570	2.75209	0.13651	5.53430
1978	79,156	0.00000	0.60582	0.05651	0.66233
1979	14,323	1.90768	2.13505	0.00000	4.04273
1980	21,672	0.52235	2.16014	0.23079	2.91328
1981	14,310	3.51962	12.61473	0.63307	16.76742
1982	12,133	2.90541	7.14714	0.94505	10.99760
1983	7,120	9.05977	24.36484	1.13305	34.55766
1984	22,751	1.29322	5.88293	0.37653	7.55268
1985	50,909	0.47585	2.67123	0.33942	3.48650
1986	29,548	0.00000	3.15530	0.44358	3.59888
1987	24,483	0.00000	3.54539	1.04627	4.59166
1988	30,703	1.51417	8.58841	1.42979	11.53237
1989	24,872	0.11184	6.46375	5.71932	12.29491
1990	20,871	1.48264	8.26697	0.80915	10.55876
1991	44,745	0.59753	1.95083	0.12931	2.67767
1992	96,382	2.38730	4.20484	0.19860	6.79074
1993	67,770	1.07000	1.35159	0.10130	2.52289
1994	151,821	0.30530	0.88726	0.03062	1.22318
1995	119,344	0.58343	0.37619	0.01347	0.97309
1996	251,803	0.01674	0.23128		
1997	53,492	0.46516			
1998	101,631				
1999	33,924				
Mean: Brood Years 1968-97 (exclusive of outliers, in bold)					
All Odd Years	37,519	1.54877	2.92891	0.31037	5.22419
All Even Years	63,216	0.87887	3.35101	0.33805	4.85235
All Years	50,368	1.20227	3.15503	0.32472	5.03138
Mean: Brood Years 1994-97 (exclusive of outliers, in bold)					
All Years	144,115	0.34266	0.49824	0.02205	1.09814
2001 Forecast		34,825	26,652	5,551	

Table A-5-b. 2001 Hood Canal Natural Fall Chum Parent Brood Escapement Distribution

Area	1998	1997	1996
9A	0.00%	0.00%	0.00%
12	3.11%	2.61%	1.02%
12A	0.86%	6.65%	4.51%
12B	46.30%	54.24%	45.69%
12C	17.44%	10.90%	15.08%
82G	9.56%	13.62%	5.05%
12D	22.73%	11.97%	28.65%

Table A-5-c. Apportionment of the 2001 PNPTC Hood Canal Natural Fall Chum Run

Area	3's	4's	5's	Total
9A	0	0	0	0
12	1,083	695	57	1,835
12A	299	1,773	250	2,322
12B	16,124	14,457	2,536	33,117
12C	6,073	2,906	837	9,816
82G	3,329	3,631	280	7,240
12D	7,916	3,191	1,591	12,697
Total	34,825	26,652	5,551	67,028

A-5.1.2 WDFW Forecasting Approach

The 2001 return of Hood Canal natural fall-timed chum salmon was forecast as a portion of the total return, of all Puget Sound natural chum. The anticipated Puget Sound return was estimated for each age group as follows: Three-year olds were estimated using the return per spawner rate of 1, given recent performance of broods at or near the 1998 parent escapement of ~800k, times the mean proportion of the total, returning at age 3. Four year olds were estimated using the mean return per spawner, from even numbered year broods (1968-1997 broods), times the mean proportion of the total, returning at age 4. Finally, the five year old return was estimated using the 1999 return of 3 year olds plus the 2000 return of four year olds, expanding it to total anticipated brood survival (using the mean of the 1968-1996 even numbered year broods), times the mean proportion of 5 year olds (Tables A-5-d and A-5-e).

Finally, the anticipated return, of each age group to Puget Sound, was apportioned to individual regions (including Hood Canal) and into regional production units, using the escapement distribution proportions, in each of the pertinent brood years. (Table A-5-f).

The resulting forecast for Hood Canal was 17,133 age 3, 77,353 age 4, and 6,736 age 5, totaling 101,222 fall chum.

Table A-5-d. Puget Sound Mean Recruits per Spawner and Mean Age at Return per Brood Type

Mean Puget Sound Fall Chum Salmon Return per Spawner and Return by Age (BY 68-97)			
	Odd BY	Even BY	All BY
Recruits / Spawner	3.03140	2.72697	2.98476
Mean Puget Sound Age Distribution per Brood (1968-97 Broods)			
Age 3	0.37919	0.16819	0.26617
Age 4	0.55196	0.78068	0.67176
Age 5	0.06885	0.05113	0.06207

Table A-5-e. Puget Sound Forecast of Fall Chum Salmon, Using the Sibling Return Method

	Brood Escapement	Mean R/S	Predicted Return	Proportion Completed	Mean Proportion at Age	Forecast Return
Age 3 (BY 97)	888,439	1.00234	890,524	0	0.16819	149,776
Age 4 (BY 96)	167,816	2.61988	439,659	0	0.55196	242,674
Age 5 (BY 95)	883,464	Sibling(1.91)	462,206	0	0.05113	23,633

Table A-5-f. Apportionment of Puget Sound Natural Fall Chum Forecast to Hood Canal and Hood Canal Production Units

		Age 3		Age 4		Age 5	Total
Puget Sound Forecast		149,776		242,674		23,633	416,083
Apportionment, Based on Brood Year Escapement Contribution							
Hood Canal	0.11439	17,133	0.31875	77,352	0.28502	6,736	101,221
12	0.03165	542	0.02673	2,068	0.01031	69	2,679
12A	0.00875	150	0.06819	5,275	0.04552	307	5,731
12B	0.47115	8,072	0.55608	43,014	0.46115	3,106	54,192
12C	0.17745	3,040	0.11178	8,646	0.15196	1,024	12,710
82G	0.07975	1,366	0.11449	8,856	0.04181	282	10,504
12D	0.23125	3,962	0.12273	9,493	0.28924	1,948	15,404

A-5.2 Hatchery Runs.

The 2001 hatchery-origin returns (including in-stream augmentation) of fall-timed chum salmon were generally forecasted using average returns-at-age-per-pound released, to Puget Sound net fisheries and escapements, using historical run sizes from the chum database, historical releases from each facility, and applying them to releases from brood years 1996, 1997, and 1998. In estimating the returns, the following information was used for each facility.

A-5.2.1 PNPTC Hatchery Forecasts

Hoodsport Hatchery: Mean return rate of age 3, 4, and 5 fish per pound planted at Finch Creek (1994-1997 broods) (Table A-5-g). The resulting forecast for 2001 is 73,209.

George Adams/McKernan Hatcheries: Mean return rate of age 3, age 4, and age 5 fish per pound released (1994-97 broods). The age specific return rates for age 3 (brood 1995) was determined to be an outlier and was excluded from the estimation of the age specific mean return rates (Table A-5-h). The resulting forecast for 2001 is 57,279.

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-i). The resulting forecast for 2001 is based on the fingerling releases of 2,916 lbs (BY 98), 3,511 lbs (BY 97), and 2,180 lbs (BY 96), which were used to estimate the return of 3, 4, and 5-year olds respectively, for a total return of 13,320.

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-g). The resulting forecast for 2001 is based on the fingerling releases of 930 lbs (BY 98), 954 lbs (BY 97), and 1,296 lbs (BY 96), which were used to estimate the return of 3, 4, and 5-year olds respectively, for a total return of 3,310.

Enetai Hatchery: Mean of the available return rates of age 3, age 4 and age 5 fish per pound planted (1994-1997 broods). (Table A-5-j). The resulting forecast for 2001 is based on the fingerling releases of 3,270 lbs (BY 98), 4,068 lbs (BY 97), and 2,302 lbs (BY 96), which were used to estimate the return of 3, 4, and 5-year olds respectively, for a total return of 11,434.

The total forecast of hatchery-origin fall chum for 2001 is 158,552.

Egg box and fry-augmented runs to streams of areas 12, 12B, 12C, 12D, 82G: One half of the mean return rates of age 3, age 4, and age 5 fish per pound planted at Hoodsport Hatchery (1965-1971 broods). (Table A-5-k and A-5-l). The resulting forecast for 2001 is 645 fish. This forecast was apportioned to each area, according to the volume released from each brood year, and the resulting components were added to the corresponding natural run forecasted component.

A-5.2.2 WDFW Hatchery Forecasts

WDFW forecasts of returns, of 3 year old fall chum salmon, from hatchery releases were generally made by multiplying the BY 1998 lbs. released from each facility, by the mean recruit per pound for odd-numbered brood years for that facility. The forecast of 4 year old chum was made generally by multiplying the BY 1997 lbs. released from each facility, by the mean recruit per pound for even numbered years. Finally, the forecast of 5 year old return for forecast by multiplying the BY 1996 lbs. released from each facility, by the mean recruit per pound for odd-numbered years. An exception to this

general approach concerns release pounds of fry, where ½ the mean rate of return per pound was used. More specifically, the following information was used:

Hoodsport Hatchery: The 1972-1998 odd and even year brood means were multiplied with the pounds released, as indicated above. The resulting forecast was 53,151 age 3, 96,183 age 4, and 3,770 age 5, totaling 153,103 fall chum salmon.

George Adams / McKernan Hatcheries: The 1976-1998 odd and even year brood means were multiplied with the pounds released, as indicated above. The resulting forecast was 39,810 age 3, 54,709 age 4, and 3,001 age 5, totaling 97,519 fall chum salmon.

Quilcene Hatchery: The 1980-1998 odd and even year brood means were multiplied with the pounds released, as indicated above. The resulting forecast was 1,239 age 3, 5,375 age 4, and 180 age 5, totaling 6,794 fall chum salmon.

Little Boston Hatchery and Port Gamble Pens: The 1965-1971 odd and even year brood means of the Hoodsport Hatchery (in some cases ½ the rate was used) were multiplied with the pounds released, as indicated above. The resulting forecast was 793 age 3, 1,687 age 4, and 47 age 5, totaling 2,527 fall chum salmon.

Enetai Hatchery: The 1977-1998 odd and even year brood means were multiplied with the pounds released, as indicated above. The resulting forecast was 4,066 age 3, 7,878 age 4, and 131 age 5, totaling 12,074 fall chum salmon..

The total forecast of hatchery-origin fall chum for 2001 is 272,018.

Egg box and fry-augmented runs to streams of areas 12, 12B, 12C, 12D, 82G: The return from pounds released into Hood Canal streams (Table A-4-k) through egg-boxes, fry and fingerling releases was forecast by multiplying the lbs. released by the George Adams return rate (using ½ the rate for eggs and fry), when releases were in south Hood Canal streams. In north Hood Canal streams, the rate of Quilcene Hatchery was used instead. For BY 98 and 97, the mean rate for 3 and 5 year olds from odd numbered broods was used. No releases were made from BY 1996. The resulting forecast for 2001 is 422 fish. This forecast was apportioned to each area, according to the volume released from each brood year, and the resulting components were added to the corresponding natural run forecasted component.

Table A-5-g. Fall Chum Returns-per-Pound, by Age at Return from Hoodspport 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	0.05260	5.38779
1976	24,490	0.76752	1.81559	0.04156	2.62467
1977	21,883	3.99685	2.02135	0.02760	6.04580
1978	33,256	1.00286	2.34702	0.24486	3.59474
1979	24,238	2.98979	2.90330	0.21532	6.10841
1980	44,336	0.48750	2.24062	0.04039	2.76851
1981	23,589	3.18898	4.51989	0.36118	8.07005
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-g (cont'd). Fall Chum Returns-per-Pound,
by Age at Return from Hoodport Hatchery Releases**

1985	39,279	2.92389	5.00571	0.20594	8.13554
1986	33,036	0.53259	2.21870	0.20579	2.95708
1987	40,323	0.42814	3.70925	0.14733	4.28472
1988	36,877	3.13408	7.16899	0.29712	10.60019
1989	35,149	0.71834	1.79583	0.50845	3.02262
1990	38,422	4.27142	7.01940	0.35332	11.64414
1991	39,379	3.01183	1.87143	0.07465	4.95791
1992	33,678	2.20262	3.93974	0.12569	6.26805
1993	33,920	1.77959	4.05824	0.17676	6.01459
1994	37,075	0.73984	1.96470	0.03943	2.74397
1995	37,583	1.29662	0.93342	0.02041	2.25045
1996	25,374	0.35824	1.82208		
1997	30,276	0.24970			
1998	37,534				
1999	33,197				
All Odd Years	23,632	1.69786	2.86299	0.18664	4.82762
All Even Years	27,502	1.33320	3.89259	0.13244	5.46971
All Years	26,072	1.52106	3.31309	0.15581	5.13831
All Years 65-71	2,655	0.95938	2.41136	0.09131	3.46205
All Years 72-97	31,662	1.67228	3.56557	0.17544	5.62722
All Years 94-97	32,577	0.66110	1.57340	0.02992	2.49721
2001 Forecast		24,814	47,636	759	73,209

**Table A-5-h. 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	0.11906	0.85416	0.15224	1.12546
1979	40,273	0.36791	0.61144	0.06724	1.04659
1980	24,418	0.30974	2.11088	0.05751	2.47813
1981	12,028	3.24503	4.43634	0.36758	8.04895
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	0.20496	1.75149
1988	31,083	1.45527	4.69548	0.54805	6.69880
1989	32,315	0.52919	2.25103	0.20309	2.98331
1990	17,032	0.47710	5.81499	0.39097	6.68306
1991	30,024	1.45064	1.20399	0.05349	2.70812
1992	25,235	1.44190	2.87208	0.09257	4.40655
1993	27,016	1.22051	2.81183	0.32053	4.35287
1994	27,723	0.54600	3.79484	0.03621	4.37705
1995	22,624	3.11094	1.06483	0.00397	4.17974
1996	23,138	0.26978	0.23378		
1997	27,884	0.03172			
1998	33,530				
1999	27,365				
Average Return Brood Years (1978-97) excluding outliers in bold.					
Odd Years	27,315	0.71746	1.95976	0.20801	3.48923
Even Years	25,906	0.72644	2.63300	0.15370	3.87427
All Years	26,610	0.72245	2.33378	0.18245	3.69308
All Years 94-97	25,342	0.28250	1.69782	0.02009	4.27840
2001 Forecast		9,472	47,342	465	57,279

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-j. 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	0.75449	0.00000	0.93604
1977	5,785	1.53688	3.31116		
1978	6,514	1.40297		0.01175	
1979	2,666		0.62366	0.09225	
1980	3,053	0.43327	1.82058	0.10249	2.35634
1981	4,985	2.12474	2.89871	0.10103	5.12448
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		0.06820	
1992	2,095		3.07907	0.10528	
1993	4,297	1.78080	2.42659	0.08406	4.29145
1994	6,809	1.38412	3.03970	0.00283	4.42665
1995	3,456	4.32699	0.34679	0.66456	5.33834
1996	2,302	0.40142	0.66456		
1997	4,068	0.21438			
1998	3,270				
1999	1,483				
Average (Brood Years 1976-97). Outliers (in bold) excluded.					
Odd Years	4,096	2.11907	2.13600	0.15390	
Even Years	4,521	1.41231	1.84244	0.05444	
All Years	4,309	1.72642	1.99786	0.10124	
All Years 94-97	4,159	1.58173	1.35035	0.33370	
2001 Forecast		5,172	5,493	768	11,434

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

Area	BY 1998		BY 1997		BY 1996	
	Lbs	%	Lbs	%	Lbs	%
9A	0	0.00%	0	0.00%	0	0.00%
12	0	0.00%	141	17.21%	0	0.00%
12B	200	34.42%	0	12.33%	0	0.00%
12A	0	0.00%	0	0.00%	0	0.00%
12C	0	0.00%	0	0.00%	0	0.00%
Skokomish	0	0.00%	0	0.00%	0	0.00%
12D	381	65.58%	163	70.46%	0	0.00%
Total	581		304		0	

Table A-5-l. Apportionment of the 2001 Hood Canal Fall Chum Off-Station Forecast

Area	3's	4's	5's	Total
9A	0	0	0	0
12	0	170	0	170
12B	96	0	0	96
12A	0	0	0	0
12C	0	0	0	0
82G	0	0	0	0
12D	183	197	0	379
Total	279	367	0	645

B. Inseason Run Assessment Methods

B-1. Hood Canal Chum Salmon

The fall chum salmon is the only run among those returning to Hood Canal and tributaries for which an acceptable model for estimating abundance during the season has been found. For all other runs the preseason forecast will serve as the in-season estimate of abundance.

Prior to statistical week 43 (October 21-27), the preseason terminal run size forecast will serve as the estimate of the run entering Hood Canal. The fall chum salmon run size updates will be estimated by the first week of November. The final update model uses non-treaty purse seine cumulative catch in Areas 12/12B for weeks 43-45 (October 21-November 10). Historical catch data were grouped by calendar weeks (Sunday-Saturday) which are closest in date to this year's management weeks. The update will be based on a linear regression model relating terminal run size to cumulative catch in Hood Canal based on the years 1981-1983, 1986-1990, 1993-1995 and 1997-2000 (excluding 1984-85, 1991-92 and 1996 when non-treaty fisher effort was zero or very low). The update model is as follows:

$$\text{Hood Canal Terminal Run Size} = 98916.016 + 3.519 * (\text{CumCatch})$$

Table B-1-a. Summary Statistics of the Hood Canal Inseason Abundance Estimation Model

Using Data through weeks 43-45	
R ²	0.796
R ² Adjusted	0.781
Std Error	114163.175
N	15
Constant	98916.016
X Coefficient	3.519

Table B-1-b. Inseason Chum Abundance Estimation Data for Area 12/12B.

Year	Run Size	Catch wk43	Landings wk43	Catch wk44	Landings wk44	Catch wk45	Landings wk45	CC wk43-45	CC/CL wk43-45
1981	169,763	2,063	26	7,188	28	6,153	42	15,404	96
1982	221,740	16,124	56	16,417	66	12,236	29	44,777	151
1983	168,675	3,587	39	27,028	78	16,147	140	46,762	257
1986	498,213	4,483	33	66,591	88	57,017	153	128,091	274
1987	782,565	26,491	113	74,316	163	64,550	182	165,357	458
1988	547,105	32,540	172	31,610	104	75,437	127	139,587	403
1989	420,804	3,780	25	58,299	154	30,263	133	92,342	312
1990	288,439	19,086	46	24,952	136	12,909	84	56,947	266
1993	587,858	11,062	62	64,630	136	40,198	80	115,890	278
1994	940,107	0	0	40,923	56	151,406	111	192,329	167
1995	593,870	0	0	61,921	58	34,092	80	96,013	138
1997	441,215	34,932	38	94,196	125	51,088	104	180,216	267
1998	570,159	44,653	57	65,816	54	26,082	28	136,551	139
1999	146,056	8,446	45	5,653	18	0	0	14,099	63
2000	150,000	5,664	29	3,064	23	0	0	8,728	52