

**2003 MANAGEMENT FRAMEWORK PLAN
AND
SALMON RUNS' STATUS
FOR THE
STRAIT OF JUAN DE FUCA REGION**

Joint Report
by:
Point No Point Treaty Council
(for the Port Gamble, Lower Elwha and Jamestown S'Klallam Tribes)
Washington Department of Fish and Wildlife
Makah Tribe

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1. Introduction

1.1 General

This report has been prepared by the Point No Point Treaty Council (for the Lower Elwha, Port Gamble, and Jamestown S'Klallams), was reviewed and agreed to, by the Washington Department of Fish and Wildlife and the Makah Tribe and is intended to fulfill the parties' reporting requirements under the provisions of Section 5.2 of the Puget Sound Salmon Management Plan. This report is intended to facilitate the management of the 2003 runs of Strait of Juan de Fuca-origin salmon in that region, as well as document the methodologies used. This report covers all species of salmon (except steelhead) for the Strait of Juan de Fuca Tributaries. The regional "Management Framework" (Section 4.0) documents the parties' pre-season management framework (2003-04 State/Tribal Agreed to Fisheries Document, NWIFC, April, 2003) understandings.

This report outlines the forecasted total abundance, by management unit, for each species, except fall chum salmon. For fall chum salmon forecasts include fish taken in net fisheries and escapement, and exclude non-landed mortalities, troll, recreational, ceremonial and subsistence harvests not taken in net fisheries. 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 and inseason run assessment methods are included. Detailed information concerning the methods used to forecast the abundance of each run are presented in Appendix A.

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

1.2 Summary of the 2003 Runs and Fisheries

All of the runs returning to the Strait of Juan de Fuca rivers and streams (except for coho salmon in the Elwha River and the Dungeness Bay and River, and chinook salmon returning to the Elwha River) will be managed on the basis of natural production. Of the various runs of salmon, only the coho returning to the Elwha River and the Dungeness River are expected to be of sufficient abundance to support directed fisheries in the terminal areas. However, all runs may be harvested incidentally in fisheries for other runs and/or species in preterminal and terminal areas. In 2003, management measures were taken in fisheries to reduce impacts to Puget Sound chinook salmon and Hood Canal/Strait of Juan de Fuca summer chum salmon, currently listed as threatened.

Pre-season forecasts of abundance are provided as a guide for fisheries and conservation planning (Tables 3.1 - 3.5). The actual run sizes entering Puget Sound may deviate from the forecasts because of statistical variability, unusual rates of survival (high or low), or unanticipated changes in exploitation rates in prior fisheries. Methods used to derive the pre-season forecasts, for 2003, are detailed in Appendix A of this report. In most cases, the escapement goals indicate the currently accepted estimate of escapement abundance necessary to provide for future maximum sustainable harvest (MSH), under average progeny survival conditions. Expected escapements are those that would result from the stated forecasts after fisheries consistent with the parties' pre-season planned management framework.

With the exception of Elwha River and Dungeness River-origin coho, no runs returning to the Strait of Juan de Fuca tributaries in 2002 are expected to have a significant harvestable surplus available for

harvest in directed fisheries. Therefore, the parties' management framework has focused on the need to provide opportunity to limited fisheries while striving to maintain protective and rehabilitative measures for Strait of Juan de Fuca salmon returning to natural spawning areas (See Section 4.0 of this report).

2. 2003 Fishery Management Periods

Area	Chinook	Pink	Summer Chum	Coho	E. Fall Chum	L. Fall Chum	Winter Steelhead
6D & Dungen. I	07/27-09/20	08/10-09/27	---	09/21-10/25	10/26-11/29	---	11/30-3/31
Dungeness II	08/10-09/20	08/10-10/11	---	09/21-10/25	10/26-12/13	---	12/14-04/15
Elwha	07/20-09/13	---	---	09/14-11/08	11/09-12/06	---	12/07-04/15
Discovery-Sequim Tributaries	---	---	09/14-10/25	10/26-12/29	---	---	12/01-04/30
Hoko-Sekiu	09/07-11/10	---	---	09/28-11/15	11/16-12/06	---	12/07-03/31
Misc. SJF Tributaries	09/07-11/10	---	---	09/28-11/08	11/09-12/15	11/30-12/31	12/01-04/15

Notes: Region I of the Dungeness River (Dung. I), extends from the Schoolhouse Bridge, downstream to the river mouth. It is located in the area of tidal influence, and therefore it is managed concurrent with the rest of Dungeness Bay (Area 6D). Shaded portions in the above table indicate no adjustment to eliminate overlaps/gaps was applied.

The management periods defined above 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 (actual and/or expected) of that species, 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 stocks throughout their entire entry while continuing to simultaneously manage fisheries on other species and stocks. In managing fisheries, the parties shall attempt to apportion the harvest throughout each management period in order to achieve catch and escapement from all segments of each run.

For 2003, the above management periods have been derived by the following steps: first the central 80% of the average 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 the affected parties. Next, "overlaps" and "gaps" between the periods were eliminated, generally by halving. 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 actions.

Finally, 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 stock.

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

3.1 Summer/Fall Chinook Salmon

**Strait of Juan de Fuca Chinook Salmon Management / Production
Units**

Fishery	Elwha R.	Dungeness R.	Hoko R.	Total
	Aggregate	Supplemented	Natural	
Recruits	2,785	452	1,015	4,252
Canada	408	66	150	624
Alaska	79	13	27	119
S.Falcon Tr/Rec	0	0	0	0
N.Falcon Tr/Rec	15	3	7	24
P.S. Troll	6	1	3	10
No. Snd + Strait Recreational	40	7	24	71
Cntl. + So. Sound Recreational	44	7	13	64
Puget Sound Net	20	3	7	30
6D Net	0	1	0	1
FW Recreational	1	0	0	1
FW Net	2	0	0	2
Mgmt Unit Harvest	615	100	230	945
Extreme Terminal Natural Mortality	45	0	0	45
Mgmt Unit Escap.	2,126	352	785	3,262
Min. Escap. Goal	2,099	347	779	3,225

The abundance of runs returning to rivers other than the Dungeness, Elwha, and Hoko, is quite uncertain. Estimates of pre-terminal harvests terminal run size are based on FRAM run #1603AEQfix. The initial Dungeness River forecast was for chinook salmon expected to return to the terminal area. The Elwha run has been forecast as a single unit because a portion of the progeny of natural spawners is taken for hatchery brood stock, and conversely, a portion of the hatchery return spawns in the river. Methods used to forecast the Dungeness, Elwha and Hoko River runs are further detailed in Appendix A-1 of this report.

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

Escapement goals are those outlined in the Puget Sound Comprehensive Chinook Management Plan-Harvest Management Component (2/19/2003). Methods used to estimate the expected escapement, and

the escapement distribution, after anticipated pre-spawning mortalities and broodstock removals in the Elwha River, are detailed in Appendix A-1. The expected escapement in the Hoko River includes any brood take by the Makah Tribe for in-river run augmentation. In all cases, little or no harvestable surplus is indicated under the current exploitation rate based management approach, therefore no commercial or recreational fisheries directed at chinook salmon are anticipated in the extreme terminal areas.

3.2 Pink Salmon

The pink salmon runs to the tributaries of the Strait of Juan De Fuca consist primarily of a natural run to the Dungeness River. The optimum level of escapement, for these primary management units of pink salmon, is currently unresolved. The parties agree that these units are forecast to return at levels well below their escapement needs and no harvestable surplus has been forecast for 2003. We believe that the 2003 return may be significantly lower than predicted, because of a significant flood event during its instream residence. However we have not quantified the potential losses from that event. The WDFW used a regression relationship, between cycle year survival rates and daily mean incubation period stream flows, to adjust its forecast to a Puget Sound run of 53,541. Details of the 2003 forecasting methods can be found in Appendix A-2 of this report. The estimated pre-terminal harvest rate has been forecast using the 1991 to 2001 average proportion of these runs intercepted in Canadian and Washington net fisheries directed at Fraser River runs (odd years).

Production Unit	Total Recruits	CDN Harvest	WA PreTerminal Harvest	Expected Escapement	Escapement Goal
Dungeness R.	162,823	13,026	13,417	136,381	N/A

3.3 Summer Chum Salmon

Production Unit	Total Recruits	CDN Harvest	WA Preterminal Harvest	Expected Escapement	Escapement Goal
Chimacum Creek	467	29	12	425	91.2 % of recruits
Discovery Bay	2,573	162	64	2,347	91.2 % of recruits
Sequim Bay	92	6	2	83	91.2 % of recruits
Totals	3,131	197	78	2,856	

The methods used to develop the 2003 forecasts of summer chum salmon returning to the streams of Discovery Bay and Sequim Bay are detailed in Appendix A-3 of this report. The escapement targets of the Base Conservation Regime (BCR), of the Summer Chum Salmon Conservation Initiative, are those which would result on the average given application of the exploitation rate based regime. The 2003 summer chum run was forecast as total recruits to fisheries and escapement. In addition to the Discovery Bay and Sequim Bay production units, Chimacum Creek is also expected to receive returns from a reintroduction program. The 2003 forecast of these returns is based on only a few years' data, therefore it should be considered conservatively.

In 1999, the Hood Canal-Strait of Juan de Fuca ESU summer-run chum salmon was listed as threatened by NMFS (50 CFR part 223) and the ESA Section 4(d). The Hood Canal-Strait of Juan De Fuca ESU includes tributaries of Sequim Bay, Discovery Bay, and the Dungeness River. Given the low number of forecasted returns and the closure of terminal area fisheries during the summer chum entry in these areas, very little incidental harvest is anticipated.

3.4 Coho Salmon

Strait of Juan de Fuca Coho Salmon Management / Production Units							
Fishery	Miscellaneous Natural		Elwha R.	Dungeness R.	Subtotals		Total
	Eastern Natural	Western Natural	Aggregate ⁽¹⁾	Aggregate ⁽¹⁾	Natural	Hatchery & Secondary Natural	
Recruits	2,253	17,803	5,241	18,805	20,056	24,046	44,102
Canada	5	50	18	128	55	146	201
Alaska	0	3	1	3	3	4	7
S.Falcon Tr/Rec	4	47	10	95	51	105	156
N.Falcon Tr/Rec	123	986	311	1,640	1,109	1,951	3,060
P.S. Troll	0	3	0	3	3	3	6
Strait Rec.	74	577	229	2,298	651	2,527	3,178
SJI Rec.	0	0	0	0	0	0	0
Admiralty	2	19	5	23	21	28	49
N. Sound Rec.	0	0	0	0	0	0	0
S. Sound Rec.	3	22	5	19	25	24	49
Hood Canal Rec.	0	0	0	0	0	0	0
Strait Net	84	658	166	622	742	788	1,530
San Juans Net	0	5	0	9	5	9	14
Admiralty Net	0	0	0	0	0	0	0
No. Sound Net	0	2	0	2	2	2	4
So. Sound Net	1	18	4	24	19	28	47
Hood Canal Net	4	30	8	45	34	53	87
SJF Rivers Rec.	0	0	588	2,201	0	2,789	2,789
6D Net	0	0	0	4,285	0	4,285	4,285
Elwha/Dungen. Net	0	0	1,791	0	0	1,791	1,791
Miscell. Net	0	16	0	0	16	0	16
Mgmt Unit Harvest	300	2,436	3,136	11,397	2,736	14,533	17,269
Mgmt Unit Exp. Escapement	1,953	15,367	2,105	7,408	17,320	9,513	26,833
Min. Escap. Goal	1,352	10,682	1,233	2,452	12,034	3,685	15,719

Notes: (1) The Elwha R. "Aggregate" is composed of 6.6% secondary wild, and 93.4% hatchery coho salmon. The Dungeness R. "Aggregate" is composed of 27.1% secondary wild and 72.9% hatchery coho salmon.

The coho salmon runs returning to the Strait of Juan de Fuca tributaries consist of several small component natural runs in all river systems, as well as hatchery-supported returns to the Elwha and Dungeness Rivers. The Dungeness and Elwha origin runs are the only ones which were predicted to have harvestable numbers of coho salmon, sufficient to support directed fisheries in the terminal and extreme terminal areas in 2003.

Methods used to develop the forecasts for the 2003 season are summarized in Appendix A-4 of this report. Expected harvest numbers refer to the total anticipated harvests from both incidental and targeted fisheries which were modeled pre-season in FRAM run #0319. In 2003, given the low expected returns of coho to the Strait primary units, the tribal and state co-managers considered the significantly lower expected interceptions in Canadian fisheries and structured the pre-season management framework to achieve a total exploitation rate of less than 40% for Strait of Juan de Fuca “primary” production units, which are managed for wild coho salmon. The escapement goals for aggregated management units are those necessary to meet the parties' agreed-upon enhanced production.

3.5 Fall Chum Salmon

Production Unit	"4B" Run	Pre-Terminal Harvest	Terminal Run	Extr. Terminal Harvest	Expected Escapement	Escapement Goal
Dungeness R.	346	18	328	0	328	500
Deep Crk.	346	18	328	0	328	500
Pysht R.	1,143	59	1,083	8	1,075	1,650
Miscellaneous	658	34	624	15	608	900
Totals	2,494	130	2,364	24	2,340	3,550

Methods used to develop the forecasts of fall-timed chum salmon returning to the Strait of Juan de Fuca streams in 2003 are detailed in Appendix A-5 of this report. The final forecast for 2003 is the average of the forecast results, for each individual unit, obtained by PNPTC and WDFW, using different forecasting methods, shown in Appendix A-5 of this report. The expected harvests refer to the total incidental catch from these runs during preterminal and terminal area fisheries directed at other species and stocks. For 2003, no directed fishery is anticipated in the terminal or extreme terminal areas. The escapement goals are based on the overall escapement goal of 3,550 fall chum salmon for the region, as re-apportioned in 1987 on the basis of relative stock strength. These escapement goals are treated as interim, pending the development of more accurate escapement targets.

4. Pre-Season Management Framework

4.1 2003 Harvest Management Measures and Expected Fisheries

In 2003, the condition of the salmon runs returning to the Strait of Juan de Fuca terminal areas requires that harvest management plans be conservative in all respects. The expected return of most runs in 2003 is very low and it appears that only hatchery coho salmon returning to the Elwha and Dungeness areas will be sufficiently abundant to warrant directed fisheries. In particular, the planned restrictions on Canadian fisheries (designed to protect British Columbia coho salmon) combined with improved escapements of wild coho to Strait streams, have afforded us the opportunity to implement exploitation rate based management for wild coho, by adopting conservative management practices.

4.1.1 Commercial Fisheries

In the Strait of Juan de Fuca, treaty Indian troll fisheries are anticipated, from 6/16 through 9/15, in Areas 5, 6 (west of Green Pt.), and 6C. During that period, chum salmon will be released and the following areas shall be closed to trolling: 1,000 ft. radius around stream mouths, Freshwater Bay, Port Angeles Harbor and Hoko Bay from Kydaka Pt. to Shipwreck Pt. From 9/16 through 4/15/2004 treaty Indian troll fisheries are anticipated in Areas 5, 6, 6C, as well as Area 4B, with the following restrictions: 1,000 ft. radius closure around stream mouths, release of coho in Area 6, through 12/31, and release of chum salmon through 9/30.

Treaty Indian commercial net fisheries generally occur in the nearshore marine areas of the Strait of Juan de Fuca from Angeles Point to Neah Bay (Areas 4B, 5, 6C), using set net gear. These fisheries harvest a mixture of passing stocks as well as concentrations of local stocks. The only terminal area in this region is Dungeness Bay (Area 6D) and fisheries in this area consist primarily of treaty set net and non-treaty skiff gillnet fisheries which target coho salmon runs returning to the Dungeness River. In extreme terminal areas (rivers), treaty Indian set net, hook-and-line, and occasionally drift net fisheries take place.

During the 2003 season, treaty Indian set net fisheries for chinook salmon, in Areas 4B and 5, will operate from June 16 through August 16. A 6.5" minimum mesh size restriction shall be used in order to avoid the capture of Lake Washington sockeye. In these areas, Hoko Bay will be closed from Kydaka Pt. to Shipwreck Pt., in addition to a closure of 1,000 ft. around all stream mouths. A treaty Indian drift gillnet fishery directed at Fraser River sockeye and pink salmon, in Areas 4B, 5, 6C is planned (est. start 7/20) to end no later than 9/13. In Area 6, Treaty Indian gillnet fisheries for Fraser River sockeye salmon are anticipated in the month of August, with fisheries targeting pink salmon in the first two weeks of September. Drift gillnet fisheries for coho salmon will operate in Areas 4B, 5 and 6C, from the end of the Fraser Panel control, through October 11, with the chum salmon fishery following at 5 days per week, from October 12 through November 8. The coho fishery shall be managed to ensure that the pre-season estimated incidental and directed coho catch is not greatly exceeded. In order to accomplish this, openings may vary from 1 to 5 days per week.

In Area 6D, no commercial fisheries will take place during the chinook and fall chum salmon management periods in order to maximize the protection necessary to these weak runs. Treaty Indian fisheries for coho salmon are planned for Area 6D from 9/21 through 11/01, with daytime only gillnet fishing and a requirement of chinook and chum salmon release through 10/10. A non-treaty skiff gill net fishery is planned from 9/29 through 10/31 with non-retention of chinook and chum salmon. These measures are intended to provide additional protection to ESA listed chinook and summer chum salmon. During fisheries for coho salmon, an area closure within 1,500 feet seaward from each mouth of the Dungeness River, will be used to further limit the harvest of non target species as well as concentrated schools of

coho salmon milling at the river mouth. If surveys indicate a high likelihood of fishing impact to chinook and or summer chum salmon, additional measures may be employed including time-area restrictions, gear restrictions etc., as necessary. During this fishery, fishers will be required to attend to their gear at all times, when release of non target species is in effect. Inseason, the extent and duration of the coho fishery will be determined by the fishing effort and the inseason estimate of the coho run abundance entering the terminal area.

Of the various extreme terminal areas (rivers) along the Strait of Juan de Fuca, treaty Indian commercial fisheries are anticipated only in the Elwha River and, if necessary, in the Dungeness River. All other rivers shall remain closed to commercial salmon fishing at all times prior to the 2003-2004 winter steelhead salmon season.

In the Dungeness River, downstream of the U.S. Hwy. 101, if a harvestable surplus of coho is available, fisheries of up to 3 days per week may be authorized using selective gear (any gear that is capable of releasing salmon alive) only, starting no earlier than October 16. This restriction will be necessary because of low water conditions and the potential impact on non-target species in need of protection. The extent and duration of such fisheries will depend on the findings of in-season stream surveys.

The treaty net fishery for coho in Area 76B (Elwha River) has been planned to occur from 9/14 through 11/8. Drift gillnets may be authorized only if river flow conditions require their use. The start of the coho fishery may also be "shaped", to the extent necessary, to avoid unnecessary impacts to chinook escapement and broodstock collection. In order to ensure that coho escapement needs are met, the fishery will be restricted to areas upstream of the Elwha Hatchery during the last half of October (if the hatchery escapement goal has not already been achieved). Hatchery area closures will include the area from 150 ft. upstream, to 150 ft. downstream of the Elwha Hatchery and the Elwha Rearing Channel outfalls.

4.1.2 Test Fisheries

No test fisheries, directed at salmon, are anticipated in any Strait of Juan de Fuca terminal areas, during the 2003 season.

4.1.3 Recreational Fisheries

Marine area recreational fisheries in mixed-stock areas of the Strait of Juan de Fuca are detailed in 2003/2004 Sport Fishing Rules Pamphlet (WDFW 2003). Area 6D will be closed to angling from May 1 through September 30 and will then open with a two fish bag limit on coho only through October 31. It shall then be closed to salmon fishing from November 1 through April 30, 2004.

In freshwater areas, all Strait of Juan de Fuca streams, except for the Elwha River and the Dungeness River, shall be closed to recreational fishing for salmon. The Elwha River, will be closed, from the river mouth to the DFW rearing channel outfall marker, from 6/1 through 9/30. This closure will provide additional protection to the ESA listed Elwha chinook salmon stock. Angling, for coho salmon only, will be permitted from October 1 through November 15, with a six fish bag limit (four adults, 12" min. size). An area closure of 150 ft. above and below each hatchery outfall will be in effect. In the Dungeness River, angling for salmon (marked coho only) will be permitted downstream of the Dungeness Hatchery intake, at RM 11.3, from October 16 through December 31, with a four fish bag limit (12" min. size). The Dungeness River will remain closed to angling for salmon (except steelhead), from January 1 through April 30, 2003. The Hoko River shall be closed to the taking of salmon and gamefish gear shall be restricted to flyfishing during the months of September and October.

4.2 Other Recommended Measures

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

Intensive spawner surveys in summer chum drainages (Discovery Bay, Sequim Bay, Chimacum Creek, Dungeness River) should be continued in 2003 to determine the number, age, sex ratio, and distribution of spawners. In the Dungeness system, information concerning summer chum salmon is lacking. Therefore surveys of similar intensity and scope should be conducted. Mixed stock fisheries directed at other species should also be monitored and sampled (tissues for GSI analysis) for the incidence and origin of summer chum interceptions. The in-stream supplementation program, utilizing native spawners, in Salmon Creek and JimmyComeLately Creek, should be continued.

Federal, State, and Tribal fisheries agencies, and private organizations have developed and implemented a captive brood stock program designed to rehabilitate chinook salmon runs to the Dungeness River. The primary goal of this recovery program is to increase the number of fish spawning naturally in the river while maintaining the genetic characteristics of the existing Dungeness stock. The long term success of this program will depend on the continuing efforts to monitor and assess stock status, determining and correcting the factors that currently limit production (including habitat degradation), and designing and implementing long term monitoring and evaluation plans designed to determine the effectiveness of the recovery effort, as well as assist in improving management of the resource. The 2003 run will be the second return of 5 year olds returning from the broodstock program. There is a need to measure these returns as accurately as possible to evaluate initial success of the program. These efforts should be continued in accordance with the Dungeness River Chinook Rebuilding Plan. Specifically, in 2003, releases of smolts from this program should be tagged, using CWT's. Their downstream emigration should be monitored using smolt traps. Finally, studies to determine critical freshwater habitat for this species should be implemented.

In the Dungeness River, stream surveys should be used to verify clearance of chinook salmon from any anticipated fishing areas. Additionally, given pre-season agreements between the co-managers, an assessment of the mark selective recreational fishery for coho, in the Dungeness River, should be undertaken, to determine the mark ratio, encounter rates and total fishing mortality.

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

Although none have been proposed for 2003, limited test or evaluation fisheries, or instream surveys, are recommended to assess the Pysht and Lyre rivers' fall chum runs, to document run timing and age composition, and to evaluate assumptions concerning the relation of the Pysht River as an escapement index area to other tributaries in the Strait of Juan de Fuca region.

4.3 Inseason Run Size Updates

During the 2003 season, no inseason updates of run abundance will be provided for chinook, summer chum, and fall chum salmon returning to the miscellaneous Strait of Juan de Fuca streams. Since no directed fisheries are planned or anticipated for any of these runs, and no inseason management action is contemplated, the pre-season forecasted returns to the terminal areas will be sufficient.

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

For coho salmon returning to the Dungeness River system, an inseason update of terminal run abundance will be performed given that satisfactory cumulative catch per cumulative landing information from the gillnet fishery in area 6D is available. Methods that will be used to derive the inseason estimate, for 2003, are detailed in Appendix B. If sufficient fishing effort data is not available, the fishery will be managed in-season on the basis of subjective estimates of abundance, escapement progress, and fishing effort.

APPENDIX

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

A. Pre-Season Forecasting Methods

A-1. Chinook Salmon

A-1.1 Dungeness River Natural

The forecast of the Dungeness River natural-origin chinook salmon terminal area run for 2003, was estimated using the mean of the post season estimates of the 1999-02 terminal (Area 6D) runs. The run sizes for the return years 1999-02 best represent current survival conditions. The races were aggregated because of the lack of adequate information to separately quantify the returns of any spring and summer chinook salmon. The 2003 terminal area forecast return is 356 natural chinook salmon (Table A-1-a). The WDFW forecast was 345, based on the 1999-02 mean of spawning escapements.

In the Dungeness River, releases of supplementation chinook from brood years 1997-99 are expected to contribute a currently unquantified number of terminal area returns. However, returns from past supplementation releases are included indirectly, by using recent years' returns. This forecast was used to estimate recruitment inputs for pre-season simulation modeling.

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

Return Year	Escapement	Area 6D Harvest	Recreational Catch	Terminal Run
1986	238	9	7	254
1987	100	4	29	133
1988	335	5	32	372
1989	88	1	6	95
1990	310	0	51	361
1991	163	19	17	199
1992	153	1	0	154
1993	43	1	10	54
1994	65	0	0	65
1995	163	0	0	163
1996	183	0	0	183
1997	50	0	2	52
1998	110	0	0	110
1999	75	0	0	75
2000	218	0	7	225
2001	453	0	42	495
2002*	633	0		633
2003 Forecast (Average Return 1999-02)				357

(*) The 2002 estimate is preliminary and subject to revision

A-1.2 Elwha River

The 2003 forecast return of Elwha River chinook salmon, to the terminal area, was estimated as the 1999-02 average terminal area run. The resulting 2003 terminal area forecast is 2,050 (Table A-1-b). This forecast was used to estimate recruitment inputs for pre-season simulation modeling.

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

Return Year	Terminal Run	Preterminal Catch	Recreational Catch	Area 4B Run	Area 4B /Terminal
1988	8,666	417	2	9,083	1.0481
1989	5,703	113	9	5,816	1.0198
1990	3,605	39	0	3,644	1.0108
1991	3,761	63	0	3,824	1.0168
1992	4,002	54	0	4,056	1.0135
1993	1,669	26	19	1,695	1.0156
1994	1,580	42	0	1,622	1.0266
1995	1,814	38	0	1,852	1.0209
1996	1,877	7	0	1,884	1.0037
1997	2,527	44	8	2,571	1.0174
1998	2,409	7	0	2,469	1.0249
1999	1,625	5	3	1,630	1.0031
2000	1,913	7	7	1,920	1.0037
2001	2,246	6	25	2,252	1.0027
2002*	2,416				
1999-02	2,050				1.0031
2003 Forecast	2,050				

(* The 2002 estimate is preliminary and subject to revision)

Table A-1-c. Elwha River Chinook Natural and WDFW Rearing Channel Prespawning Mortalities

Return Year	Hatchery Voluntary Escapement	In-River Gross Escapement	Gaff-Seine Removals	In-Hatchery Prespawning Mortality	In-River Prespawning Mortality
1986	1,285	1,842	505	376	482
1987	1,283	4,610	1,138	432	1,830
1988	2,089	5,784	506	428	50
1989	1,135	4,352	905	148	412
1990	586	2,594	886	160	64
1991	970	2,499	857	108	N/A
1992	97	3,762	672	26	2,611
1993	165	1,404	771	7	0
1994	365	1,181	749	61	269
1995	145	1,667	518	37	625
1996	214	1,661	1,177	147	120
1997	318	2,209	624	3	7
1998	138	2,271	1,551	51	0
1999	113	1,512	609	23	0
2000	177	1,736	1,021	62	0
2001	195	2,051	1,396	38	0
2002	473	1,943	1,080	40	0

In order to estimate potential escapements, the forecasted return to the Elwha River was further apportioned, using the 1999-2002 mean proportions (Table A-1-c), as follows: Of the 2,050, **11.1%** (228) are expected to voluntarily return to the Elwha Rearing Channel, and **88.9%** (1,822) to the river. The voluntary hatchery return was reduced by **20.3%** (46), to account for average on-station pre-spawning mortality, leaving 182 hatchery spawners. The in-river escapement was not reduced for in-river pre-spawning mortality, based on recent years' survival. The 1,822 in-river escapement was reduced by **40.3%** (734) to account for broodstock removals (gaff & seine), leaving an anticipated in-river spawning escapement of 1,088 chinook salmon and an anticipated hatchery broodstock of 915.

A-1.3 Hoko River

The forecast of Hoko River chinook salmon for 2003 was estimated as the 1999-02 average return to the terminal area. The 2003 forecast estimate is 1,013 chinook salmon (Table A-1-d). This forecast was used to estimate recruitment inputs for pre-season simulation modeling.

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

Return Year	Hoko River Escapement	Commercial Catch	Recreational Catch
1986	801	38	0
1987	581	25	0
1988	776	37	7
1989	842	17	3
1990	493	5	0
1991	1,006	16	10
1992	740	9	6
1993	894	14	0
1994	428	11	8
1995	905	20	0
1996	1,265	5	4
1997	891	20	8
1998	1,722		0
1999	1,688		0
2000	731		0
2001	946		0
2002*	686		0
Average 1999-02	1,013		

*The 2002 estimate is preliminary and subject to revision.

A-2. Pink Salmon

A-2.1 Natural Runs

Naturally produced Puget Sound pink salmon were forecast in 2003 using cycle year return per spawner rates. The biennial nature of pink salmon returns result in three distinct groupings of brood year returns (Table A-2-a). The 2003 return of pink salmon to the Dungeness River was forecast by applying the mean Cycle 1 return rate (2.03) to the 2001 parent brood escapement (80,344). This results in an estimated return of 162,823 natural Dungeness pink salmon. The return-per-spawner rate from the 1961 (Cycle 2) and the 1963 and 1999 broods (Cycle 3) were excluded from the calculation of mean return rates, as outliers (Table A-2-b).

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

Run Year	Escapement	Terminal Run	Total Recruits
1959	40,000	40,000	64,603
1961	70,000	70,000	90,964
1963	400,000	400,000	954,051
1965	70,000	75,000	105,640
1967	95,000	117,400	213,494
1969	14,400	14,400	20,425
1971	46,000	46,000	63,576
1973	47,000	47,000	76,423
1975	24,500	24,900	39,618
1977	35,500	35,600	61,687
1979	50,000	57,800	130,182
1981	2,900	2,900	5,532
1983	4,900	4,900	5,642
1985	4,700	4,700	6,447
1987	1,900	1,900	2,298
1989	10,900	10,900	17,778
1991	9,900	9,900	15,021
1993	1,695	1,695	1,903
1995	8,352	8,352	10,546
1997	4,953	4,953	8,697
1999	7,306	7,306	7,393
2001	80,344	80,344	83,832

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

Cycle 1 BY	Cycle 1 R/S	Cycle 2 BY	Cycle 2 R/S	Cycle 3 BY	Cycle 3 R/S
1959	2.27	1961	13.63	1963	0.26
1965	2.85	1967	0.22	1969	4.42
1971	1.66	1973	0.84	1975	2.52
1977	3.67	1979	0.11	1981	1.95
1983	1.32	1985	0.49	1987	9.36
1989	1.38	1991	0.19	1993	6.22
1995	1.04	1997	1.47	1999	11.47
2001		2003		2005	
Average:	2.03		0.55		4.89
Std.Dev.	0.95		0.52		3.01
2003 Forecast (CY 1) Recruits					162,823

Note: The WDFW used an additional step in forecasting the Dungeness River pink salmon run. This was done in order to adjust for the record floods that occurred, during incubation, in January, 2002. A regression of maximum daily mean flow (during incubation) against CY 1 recruits per spawner was used to derive a prediction R/S value of 0.667. This resulted in a WDFW forecasted return to Puget Sound (4B run) of 53,541.

A-3. Summer Chum Salmon

The 2003 return of summer-timed chum to the three Strait of Juan de Fuca Management Units (Chimacum, Discovery and Sequim) was forecasted as an 4 year mean of total recruits to fisheries and escapements, separately for each of these units in the 1999 through 2002 return years (Table A-3-a). The forecasts are 2,573 fish to Discovery MU, 92 fish to Sequim MU and 467 to the Chimacum MU. Recruits to the Dungeness / Graywolf system are unquantifiable at this time.

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

Year	Discovery	Sequim	Chimacum	Eastern Strait Total
1974	1,494	492		1,986
1975	1,374	373		1,747
1976	1,264	409		1,673
1977	1,364	446		1,810
1978	2,413	828		3,241
1979	699	201		900
1980	4,127	1,447		5,574
1981	879	261		1,140
1982	2,771	771		3,542
1983	946	272		1,218
1984	1,311	397		1,708
1985	304	108		412
1986	890	327		1,217
1987	1,673	508		2,181
1988	2,952	1,177		4,129
1989	441	355		796
1990	432	98		530
1991	253	172		425
1992	592	802		1,394
1993	520	124		644
1994	196	18		214
1995	647	234		881
1996	1,075	31		1,106
1997	923	62		985
1998	1,206	101		1,307
1999	532	7	38	577
2000	879	55	52	986
2001	2,811	262	909	3,982
2002*	6,071	42	867	6,980
2003 Forecast (99-02 Avg.):	2,573	92	467	3,131

*The 2002 estimate is preliminary and subject to revision

A-4. Coho Salmon

A-4.1 Natural Runs

The method used to develop the 2003 forecasted return of naturally reared coho salmon, for primary units, relied on an estimate of emigrating smolts (2002 emigration), multiplied by an estimate of marine survival.

A-4.1.1 Naturally reared smolts

For primary units in the Western Strait of Juan de Fuca (SJF) the number of smolts from six production units, comprising 21.64% of the total, was measured and expanded to 234,903 smolts for the sub-region (Table A-4-a). For primary units in the Eastern SJF the number of smolts from two production units, comprising 13.98% of the total, was measured and expanded to 29,821 smolts for the sub-region (Table A-4-a). The total number of estimated smolts, produced from primary units, is 264,724.

The number of emigrating smolts from secondary units (Elwha River and Dungeness River) was estimated by extrapolation, using the ratio of the natural escapement of the secondary units to that of the primary units in the parent brood year (2000) (Table A-4-b). This resulted in estimate of 71,325 smolts.

A-4.1.2 Marine Survival

The forecasted survival value of 10.14% was obtained by estimating an average spawner/smolts relationship, using escapement in parent years 1996-1998 and smolt emigration in years 1998-2000 with associated recruitment in return years 1999-2001. Applying this marine survival value to the estimates of emigrating smolts, resulted in an estimate of primary DA2 coho recruits (3,024 Eastern and 23,821 Western) (Table A-4-c) and estimate of 7,233 DA2 coho recruits from secondary units (463 Elwha and 6,770 Dungeness) (Table A-4-d).

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

Smolt Trapping	Enumerated Smolts	Enumerated Proportion of Total Potential	Estimated Total Smolts
Jimmycomelately Crk	934		
Siebert Crk	3,235		
East Total	4,169	0.13980	29,821
Salt Crk	16,416		
E. Twin R.	7,651		
W. Twin R.	3,629		
Deep Crk	8,863		
Little Hoko R.	5,491		
Johnson Crk	8,790		
West Total	50,840	0.21643	234,903
E+W Total	55,009		264,724

Table A-4-b. Estimation of Marine Survival

	RY 1999	RY 2000	RY 2001
Primary, Parent Escapement	5,035	5,788	16,517
Secondary, Parent Escapement	1,840	3,630	1,271
Primary Proportion	0.73236	0.61457	0.92855
Primary Recruits	14,805	23,370	31,736
Marine Survival	0.10599	0.11544	0.08279
Mean Survival			0.10141

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

Primary Management Units	Measured Smolts	Proportion of Total Potential Measured	Estimated Total Smolts	DA2's Using 0.10140 Marine Survival
East Strait	4,169	0.13980	29,821	3,024
West Strait	50,840	0.21643	234,903	23,819
SJF Summary	55,009		264,724	26,845

Table A-4-d. Secondary Management Units Summary

Secondary Management Units	2000 Brood Escapement Proportion	Estimated DA2's
Elwha	0.0640	463
Dungeness	0.9360	6,770
Total Secondary	1.0000	7,233

A-4.2 Hatchery Runs

The 2003 returns of Strait of Juan de Fuca hatchery coho were predicted using the estimated 1999-01 (3 years - 1 brood cycle) average smolt survival to December-Age 2 (DA2) recruits, applied to the 2002 smolt releases (Table A-4-d). More specifically, the following sources of information were selected:

Dungeness Hatchery: 1999-2001 average recruits per smolt (0.03224) (Table A-4-d). Given a release of 565,300 smolts, the 2003 forecast is 18,228 DA2 recruits.

**Table A-4-e. Strait of Juan de Fuca Hatchery Coho Contribution
to Puget Sound Net Fisheries and Escapements**

Run Year	Dungeness Hatchery			Elwha Hatchery		
	Smolts Released	DA 2 Recruits	R/Sm	Smolts Released	DA 2 Recruits	R/Sm
1979	796,100			1,387,900		
1980	399,200			837,900		
1981	679,700			1,168,700		
1982	929,400			2,845,100		
1983	106,590			2,756,200		
1984				567,800		
1985	188,000			751,000		
1986	298,000			645,400		
1987	320,000			836,000		
1988	748,600	20,948	0.02798	728,500	5,260	0.00722
1989	301,700	25,401	0.08419	240,700	15,017	0.06239
1990	359,050	20,811	0.05796	413,500	12,320	0.02979
1991	342,700	12,102	0.03531	768,600	3,522	0.00458
1992	296,400	14,058	0.04743	688,600	9,848	0.01430
1993	433,700	9,789	0.02257	755,600	4,913	0.00650
1994	340,000	8,923	0.02624	580,000	2,504	0.00432
1995	680,000	26,830	0.03946	707,700	10,250	0.01448
1996	808,700	29,804	0.03685	801,000	13,705	0.01711
1997	871,600	16,596	0.01904	722,200	11,988	0.01660
1998	774,600	8,287	0.01070	643,037	6,272	0.00975
1999	877,300	5,182	0.00591	867,379	7,759	0.00895
2000	788,600	36,419	0.04618	645,856	4,093	0.00634
2001	865,700	38,648	0.04464	684,856	9,941	0.01452
2002	550,700			494,610		
2003	565,300			662,231		
Average(1999-01):			0.03224	Average (1999-01):		0.00993
2003 Forecast DA2's			18,228			6,578

Elwha Hatchery: 1999-2001 average recruits per smolt (0.00993) (Table A-4-d). Given a release of 662,231 smolts, the 2003 forecast is 6,578 DA2 recruits.

The total hatchery-origin pre-season forecast value of 24,805 DA2 recruits (18,604 Age 3 ocean) was used for simulation modeling and pre-season planning.

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

Year	E. Strait	W. Strait	Total
1986			9,883
1987			4,860
1988			4,332
1989			7,222
1990			4,030
1991			3,752
1992			6,126
1993			3,329
1994			2,503
1995			6,386
1996			5,035
1997			5,788
1998	1,389	15,128	16,517
1999	1,360	7,968	9,328
2000	2,110	16,870	18,980
2001	2,626	34,337	36,963

Note: Escapement estimation methods changed in 1998. Therefore prior estimates are not directly comparable

A-5. Fall Chum Salmon

A-5.1 Natural Fall Chum Salmon Forecast (PNPTC)

The 2003 return of fall-timed chum salmon to the Strait of Juan de Fuca tributaries was forecasted by PNPTC, in the aggregate, as the average of the natural runs observed in the years 1998 through 2002 (Table A-5-a). The resulting forecast was apportioned on the basis of historical escapement survey data which resulted in the following proportions: Pysht River (46%), Dungeness River (14%), Deep Creek (14%), and miscellaneous, including Elwha R. and Lyre R. (26%) (Table A-5-b).

A-5.2 Natural Fall Chum Salmon Forecast (WDFW)

The 2003 return of wild fall-timed chum salmon to Strait of Juan de Fuca streams was forecast as a portion of the total return of all Puget Sound natural fall-timed chum. The Puget Sound return was initially forecast using parent brood escapements, long-term odd/even-year specific average R/S values, and long-term odd/even-year specific mean proportions returning at age for 3, 4, and 5-year old returns. For example, the three-year old forecast was derived by multiplying the 2000 wild escapement by the mean even-brood R/S value to get a total return of 2000 brood offspring. That number was then multiplied by the mean return at age 3 for even-year broods, yielding the 2003 age 3 return forecast. This was repeated for 4 and 5-year old components, and all three were summed to obtain a total Puget Sound forecast of 795,873 (Table X).

When age and runsize data from the 2002 return became available, a sibling forecast was also prepared. This method uses long-term average age composition to predict 2003 returns of age 4 fish based on the 2002 age 3 return, and to predict the 2003 age 5 return based on 2001 age 3 and 2002 age 4 returns (Table XX). The final forecast averaged the R/S-based and sibling-based methods, yielding a forecast of 921,476 (Table XXX).

The return of each age group to Puget Sound was apportioned to individual regions (including Strait of Juan de Fuca) and regional production units using proportions of the parent escapement of each brood into these smaller areas. Forecasts for these areas can be seen in Table XXXX.

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

Return Year	Fall Chum Run Size	Return Year	Fall Chum Run Size
1980	5,862	1991	1,941
1981	6,518	1992	5,654
1982	6,744	1993	5,775
1983	1,765	1994	2,564
1984	8,280	1995	610
1985	8,330	1996	2,162
1986	1,922	1997	3,927
1987	7,269	1998	1,535
1988	13,962	1999	1,313
1989	4,331	2000	269
1990	1,220	2001	1,737
		2002	5,198
Average (All Yrs.):			3,860
PNPTC Average 1998-02:			2,010
Std. Dev. (98-02):			1,672

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

Parent Brood	Age	Parent Escapement	Mean R/S¹	Estimated R/S (all ages)	Mean Age Composition¹	Natural Forecast
1998	5	888,442	2.57	2,284,126	0.051	115,759
1999	4	337,400	3.11	1,049,657	0.565	593,107
2000	3	193,763	2.57	498,153	0.175	87,006
					Total	795,872

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

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

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

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

	R/S	Sibling	Average	SJF Parent Escapement Proportion	SJF Forecast by Age
Age 3 (2000 Brood) Forecast	87,006	n/a	87,006	0.001	98
Age 4 (1999 Brood) Forecast	593,107	829,583	711,345	0.004	2,682
Age 5 (1998 Brood) Forecast	115,759	130,491	123,125	0.002	197
Total Forecast	795,873	960,073	921,476		2,977

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

Area	Proportion	PNPTC Forecast	WDFW Forecast	Joint Forecast
Pysht R	0.458	921	1,364	1,143
Dungeness R	0.139	279	413	346
Deep Creek	0.139	279	413	346
Miscellaneous	0.264	531	786	658
Total		2,010	2,977	2,494

B. Inseason Run Assessment Methods

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

B-1. Dungeness Coho Salmon

Prior to October 12, the pre-season terminal run size forecast will serve as the estimate of the run entering Dungeness Bay (Area 6D). For the Dungeness River coho salmon, run size updates will be estimated on October 10, if there has been sufficient fishing effort from September 15 through October 8, using catch and landing data through October 8. Fishing effort and harvest will be considered sufficient if the following relationship is satisfied: the catch and landings through October 8 must fall within the observed historical range of harvest data. The update will be based on a linear regression model relating terminal run size to cumulative catch and landings (treaty and nontreaty) in Area 6D based upon the years 1986-1991 and 1995-2001 (excluding 1992 and 1997 as outliers and 1993-1994 when non-treaty fisher effort was zero). The update model for October 10 is as follows:

$$6D \text{ Run Size} = -1081.765 + (405.340 * CC/CL \text{ through } 10/8)$$

The updated run abundance entering the terminal area will represent the total abundance. The hatchery/natural ratio that is being used shall be assumed to be as forecast pre-season.

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

Table B-1-a. Summary Statistics of the Area 6D Inseason Abundance Estimation Model

Using Data through Oct - 8	
R ²	0.913
R ² Adjusted	0.905
Std Error	2739.740
N	12
β ₀	-1081.765
β ₁	405.340
P(β ₀ = 0)	0.456

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

Year	Dungeness Bay Run Size			Catch	Landings	CC/CL
	Hatchery	Natural	Total			
1979	6,995	2,934	9,929			
1980	13,664	3,769	17,433			
1981	18,956	1,663	20,619			
1982	28,386	8,515	36,901			
1983	10,351	3,168	13,519			
1984	1,000	1,100	2,100			
1985	1,752	876	2,628	907	93	9.75
1986	3,149	4,013	7,162	2,637	128	20.60
1987	3,332	4,923	8,255	2,476	117	21.16
1988	4,944	1,268	6,212	2,631	184	14.30
1989	4,769	1,894	6,663	2,487	133	18.70
1990	4,330	1,134	5,464	1,304	118	11.05
1991	3,944	1,360	5,304	2,068	164	12.61
1992	2,952	519	3,471	770	68	11.32
1993	2,820	206	3,026	90	15	6.00
1994	2,554	534	3,088	923	35	26.37
1995	8,101	327	8,428	630	28	22.50
1996	7,780	181	7,961	695	32	21.72
1997	12,234	337	12,571	203	10	20.30
1998	7,966	434	8,400	2,677	83	32.25
1999	4,797	730	5,527	665	24	27.71
2000	25,487	4,786	30,273	7,054	87	81.08
2001	27,989	760	28,749	4,776	79	60.46