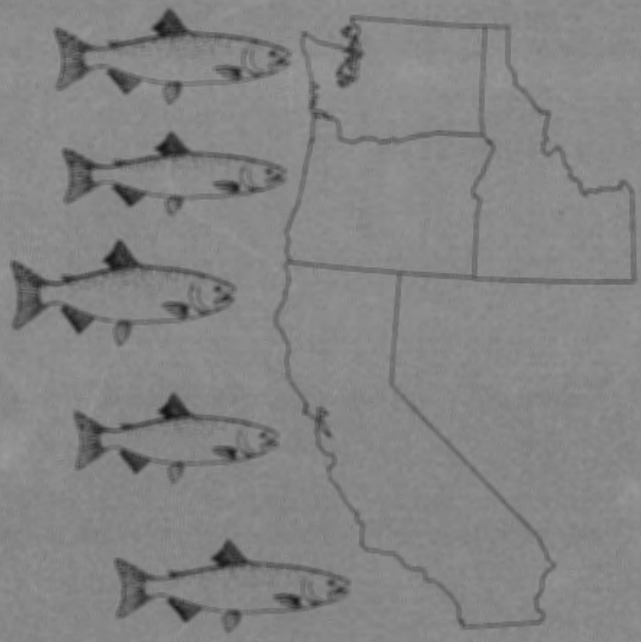
PRESEASON REPORT I

STOCK ABUNDANCE ANALYSIS FOR 1998 OCEAN SALMON FISHERIES



PREPARED BY THE
SALMON TECHNICAL TEAM

Pacific Fishery Management Council
2130 SW Fifth Avenue, Suite 224
Portland, Oregon 97201

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LIST OF ACRONYMS AND ABBREVIATIONS

CDFG	California Department of Fish and Game
Council	Pacific Fishery Management Council
CRTAC	Columbia River Technical Advisory Committee
CVI	Central Valley index
CWT	coded-wire tag
ESA	Endangered Species Act
FMP	fishery management plan
FRAM	Fishery Regulation Assessment Model
GSI	genetic stock identification
HRM	Harvest Rate Model
KMZ	Klamath management zone (ocean zone between Humbug Mountain and Horse Mountain where management emphasis is on Klamath River fall chinook)
KOHM	Klamath Ocean Harvest Model
KRTAT	Klamath River Technical Advisory Team
LRH	lower Columbia River hatchery (tule fall chinook returning to hatcheries below Bonneville Dam)
LRW	lower Columbia River wild (bright fall chinook spawning naturally below Bonneville Dam)
MCB	mid-Columbia River brights (bright hatchery fall chinook released in the mid-Columbia River)
MSY	maximum sustainable yield
NA	not available
NMFS	National Marine Fisheries Service
OCN	Oregon coastal natural (coho)
OCNL	Oregon coastal natural (coho) lake component
OCNR	Oregon coastal natural (coho) river component
ODFW	Oregon Department of Fish and Wildlife
OPI	Oregon production index (coho salmon stock index south of Leadbetter Point)
OPIH	Oregon production index area hatchery (adult coho)
OPITT	Oregon Production Index Technical Team
PRIH	Oregon coastal private hatchery (adult coho)
PSC	Pacific Salmon Commission
SCH	Spring Creek Hatchery (tule fall chinook returning to Spring Creek Hatchery)
SRS	Stratified random sampling
SSC	Scientific and Statistical Committee
STEP	Salmon Trout Enhancement Program (Oregon)
STT	Salmon Technical Team (formerly the Salmon Plan Development Team)
TAC	total allowable catch
URB	upper river brights (naturally spawning bright fall chinook normally migrating past McNary Dam)
USFWS	U.S. Fish and Wildlife Service
VSI	visual stock identification
WCVI	West Coast Vancouver Island
WDFW	Washington Department of Fish and Wildlife

INTRODUCTION

This is the second report in an annual series of four reports prepared by the Salmon Technical Team (STT) of the Pacific Fishery Management Council (Council) to document and help guide salmon fishery management off the coasts of Washington, Oregon, and California. This report will be formally reviewed at the Council's March meeting. The third and fourth reports in this series will be developed at the close of the March and April Council meetings, respectively. They will analyze the impacts of the Council's proposed and final ocean salmon fishery management recommendations for 1998.

This report provides 1998 salmon stock abundance projections and an analysis of the impacts of 1997 regulations, or regulatory procedures. The report focuses on chinook and coho stocks that have been important in determining Council fisheries in recent years. However, decisions on whether or not to propose Endangered Species Act listings for several chinook stocks ranging from central California to Puget Sound are anticipated in the near future. In the event that the National Marine Fisheries Service proposes new listings, information concerning the status of these stocks may significantly affect Council deliberations on the final salmon fishing seasons.

Chapter I provides a summary of the 1998 stock abundance projections. Chapters II and III provide detailed stock-by-stock analyses of abundance and a description of prediction methodology and accuracy of past abundance predictions for chinook and coho salmon, respectively. Chapter IV summarizes abundance information for pink salmon. Four appendices provide supplementary information as follows: Appendix A provides a summary of Council stock management goals; Appendix B contains pertinent data for Oregon production index (OPI) area coho; Appendix C provides historical salmon catch data for the Cape Flattery and Strait of Juan de Fuca areas; and Appendix D contains the Council's current harvest allocation schedules.

Summaries of preseason and postseason abundance estimates are included in:

- Table II-2 for Central Valley Index fall chinook since 1985;
- Table II-4 for Klamath River fall chinook since 1985;
- Table II-8 for selected Columbia River fall chinook stocks since 1984;
- Table II-9 for Puget Sound summer/fall chinook stocks since 1993;
- Table III-1 for OPI area produced coho stocks since 1992 and
- Table III-3 for selected naturally spawning Puget Sound and Washington coastal coho stocks since 1984.

Differences between preseason and postseason estimates are caused by a number of factors, including: (1) inaccuracies in abundance forecasts for these and other stocks which are exploited by mixed stock fisheries, (2) deviations of actual catches and fishery patterns from preseason expectations, (3) anomalies in stock distribution and migration patterns, and (4) for the Puget Sound coho stocks, differences in assessment methodologies (postseason estimates are based on run reconstruction assumptions which differ substantially from those represented in the Fishery Regulatory Assessment Model). The STT has not been able to complete a proper evaluation of abundance estimates which would take all these factors into account.

CHAPTER I
SUMMARY OF ABUNDANCE PROJECTIONS

Abundance expectations in 1998 are summarized for key chinook and coho salmon stocks in Tables I-1 and I-2, respectively. Information on pink salmon abundance is summarized in Chapter IV. Overall Council salmon management goals are presented in Appendix A, Table A-1.

EL NIÑO ADJUSTMENT FACTOR

There are indications that the 1997 abundance predictors for coho were optimistic because they did not anticipate abnormally low marine survivals associated with the current El Niño event. Postseason estimates of abundance for Columbia River, Washington Coastal, and Puget Sound stocks were substantially below expectations after allowances for lower than anticipated impacts by ocean fisheries are considered.

Impacts on growth and survival prior to the fall of 1997 will be reflected by the 1997 returns and will be automatically incorporated into sibling-based predictors currently employed for several stocks. For instance, jack returns for most Columbia River chinook and coho stocks were at or near record low levels and fish condition was noticeably poor. During the 1982-1983 El Niño, the Salmon Technical Team (STT) incorporated an adjustment factor in anticipation of abnormally high over-winter mortality with widely varying success. The STT considered and rejected incorporating an adjustment factor to compensate for abnormally high over-winter mortality that may result from the current El Niño event. The current El Niño developed more rapidly and at different times than previous events so there is a general lack of information that can be usefully employed to quantify the degree to which adjustments should be made to the survival of salmon stocks. The STT, however, is of the opinion that the abundance forecasts presented in this report for coho and Columbia River chinook stocks could likely prove to be optimistic.

CHINOOK SALMON

The 1998 Abundance Projections Compared to 1997 Projections

The 1998 abundance projections for key chinook salmon stocks occurring in the Council management area and their relationship to the previous year are summarized below. Further details for individual stocks are contained in Table I-1 and Chapter II.

- California Central Valley index: 1,051,000 fish; up 24% (about the same as 1997 postseason)
- Klamath River fall chinook (age-3 and age-4 abundance): 126,600 fish; down 19% (13% below the 1997 postseason estimate)
- Oregon coastal chinook
  - South/local migrating: Fall chinook abundance projected to be up from 1997 but well below average; spring chinook projections are not made
  - North migrating: Overall, below 1997, but with above average age-5 abundance
- Columbia River
  - Upriver spring chinook: 36,200 fish; down 47% (68% below 1997 actual return)
  - Upriver summer chinook: 17,300 fish; up 4% (38% below 1997 actual return, and fourth lowest on record)
  - Upriver brights: 150,800 fish; down 9% (8% below the 1997 actual return)

Lower Columbia River hatchery:	19,200 fish; down 65% (67% below 1997 actual return)
Spring Creek Hatchery:	14,200 fish; down 35% (45% below 1997 actual return)
Lower Columbia River wild:	8,100 fish; up 8% (34% below 1997 actual return)
Mid-Columbia River brights:	47,800 fish; down 34% (20% below 1997 actual return)

Sacramento River winter chinook, listed as endangered under the federal Endangered Species Act, are expected to remain depressed in 1998 in view of the brood year escapement in 1995. They are expected to remain depressed in 1999 in view of the adult escapement in the primary parent year of 1996 (600 adults). The 1998 Central Valley harvest index, which will primarily affect winter chinook returns in 1999, would be comparable to the 66% harvest index achieved in 1997 if 1997 regulations are repeated in 1998.

COHO SALMON

The 1998 Abundance Projections Compared to 1997 Projections

The 1998 abundance projections for key coho salmon stocks occurring in the Council management area and their relationship to the previous year are summarized below. Details for individual stocks are contained in Table I-2 and Chapter III, which includes a comparison of expected escapements with management goals for various coho stocks.

- Oregon Production Index (based on stratified random sampling [SRS] see Chapter III)

Overall:	165,800 fish; down 64% (32% below the 1997 postseason estimate)
Oregon coastal natural:	47,200 fish; down 45% (95% above the 1997 postseason estimate)
Public hatchery:	118,400 fish; down 69% (55% below the 1997 postseason estimate)

- Washington Coastal Natural Production

  Abundance forecasts for Washington coastal stocks managed for natural production are mixed, relative to 1997 preseason expectations.

Grays Harbor:	30,100 fish; up 15%
Queets River:	5,600 fish; up 30%
Hoh River:	3,400 fish; up 21%
Quillayute River fall:	8,000 fish; down 10%

- Washington Coastal Hatchery Production

  Abundance forecasts for hatchery production of all Washington coastal stocks are below 1997 preseason expectations. The decreases range from 24% for Quinault coho to 75% for Grays Harbor.

- Puget Sound

Combined natural and hatchery:	1,192,200 fish; down 32%
All natural production:	480,900 fish; down 11%
Skagit River:	55,000 fish; down 22%
Stillaguamish River:	47,800 fish; up 33%
Hood Canal:	108,000 fish; up 38%
Strait of Juan de Fuca:	16,800 fish; up 158%
All Hatchery production:	711,300 fish; down 41%

PINK SALMON

Abundance and incidental harvest of pink salmon in the Council management area is only significant in odd-numbered years.

TABLE I-1. Preliminary preseason **adult chinook** salmon stock forecasts in thousands of fish. (Page 1 of 2)

Production Area, Type of Prediction and/or Stock or Stock Grouping	Preseason Estimates of Adults (Postseason Estimates in Parentheses) 1998	1997	1996	1995	1994	Methodology for 1998 Prediction and Source
California Central Valley (Index) Sacramento and San Joaquin Basins, Fall, Late Fall and Spring Runs	1,051.0	849.0 (1,046.2)	533.0 (741.6)	654.0 (1,312.0)	503.0 (610.3)	Linear regression analysis of age-2 inriver on CVI of the following year. California Department of Fish and Game.
Klamath River (Ocean Abundance) Fall Run, Age-3 and -4 Fish	126.6	155.4 (145.4)	454.7 (287.6)	172.1 (479.8)	138.0 (99.3)	Linear regression analysis of age-specific ocean abundance estimates on inriver runs of same cohort; 1979-1992 broods. Klamath River Technical Team.
Oregon Coast						
North and South/Local Migrating		------ Preseason Estimates Not Made ------				None.
Columbia River (Ocean Escapement)						Relationships between successive age groups within a year class of Columbia River returns (selected from 1975-1994 broods for fall chinook stocks) or as noted below. Columbia River Joint Staff.
Upriver Spring	36.2	67.8 (114.1)	37.2 (51.5)	12.0 (10.2)	49.0 (21.1)	
Willamette Spring	32.8	30.0 (34.3)	38.7 (33.2)	48.5 (40.8)	72.0 (46.4)	
Sandy Spring	3.9	3.8 (5.2)	3.3 (4.1)	4.3 (2.5)	5.5 (3.5)	
Cowlitz Spring	1.5	1.4 (1.7)	1.9 (1.9)	1.4 (2.2)	6.3 (3.1)	
Kalama Spring	0.5	0.7 (0.5)	0.6 (0.5)	0.5 (0.7)	1.0 (1.3)	
Lewis Spring	0.9	2.4 (1.9)	1.9 (1.6)	2.7 (3.7)	5.0 (3.0)	
Upriver Summer	17.3	16.7 (28.0)	16.8 (16.1)	9.6 (15.0)	15.7 (17.7)	Adult to jack regression. Columbia River Joint Staff.
URB Fall	150.8	166.4 (164.5)	88.9 (143.2)	110.3 (106.5)	85.4 (132.9)	
SCH Fall	14.2	21.9 (26.0)	27.6 (33.1)	17.5 (33.8)	20.2 (18.5)	
LRW Fall	8.1	7.5 (12.3)	8.8 (14.6)	12.4 (16.0)	14.7 (12.2)	
LRH Fall	19.2	54.2 (57.4)	37.7 (75.5)	35.8 (46.3)	36.1 (53.6)	
MCB Fall	47.8	72.1 (60.0)	40.8 (59.7)	26.5 (34.1)	23.9 (33.7)	
Washington Coast						
Willapa Bay Natural	4.2	-	-	-	-	
Willapa Bay Hatchery	15.5	64.5	49.0 (54.0)	34.6 (48.8)	- (41.8)	Mean return per release by age class.
Other Coastal Stocks		-------- Not Available --------				Washington Department of Fish and Wildlife and tribes.

TABLE I-1. Preliminary preseason **adult chinook** salmon stock forecasts in thousands of fish. (Page 2 of 2)

Production Area, Type of Prediction and/or Stock or Stock Grouping		Preseason Estimates of Adults (Postseason Estimates in Parentheses) 1998	1997	1996	1995	1994	Methodology for 1998 Prediction and Source
Puget Sound[a/]							Washington Department of Fish and Wildlife and tribes.
Nooksack/Samish	Hatchery	28.0	34.0	27.0	38.5 (22.2)	46.6 (28.1)	1994 brood release times average return/release.
East Sound Bay	Hatchery	0.5	1.2	1.7	3.5 (0.1)	3.2 (0.8)	Average 1994-1996 run size.
Skagit	Natural	6.6	6.4	7.1	5.0 (9.6)	8.4 (6.6)	Age specific return rates times brood release.
	Hatchery	0.0	0.1	1.0	1.6 (3.3)	1.3 (4.3)	1994 brood release times average return per release.
Stillaguamish	Natural	1.6	1.6	1.3	1.8 (1.4)	1.4 (1.3)	1993-1996 mean run size.
Snohomish	Natural	5.6	5.2	4.2	4.3 (5.9)	4.5 (5.0)	Average of 1992-1996 run size.
	Hatchery	6.5	7.7	6.7	2.2 (6.0)	1.8 (5.4)	1994 brood release times average return per release.
Tulalip	Hatchery	2.5	4.0	2.7	2.3 (4.1)	2.8 (1.9)	1994 brood release times average return per release.
South Puget Sound	Natural	21.8	18.2	19.0	21.7 (34.5)	18.0 (29.9)	1994 brood escapement times average return per spawner for: Green River and Puyallup. Mean run size for Nisqually and Carr Inlet. Average of 2 different methods for Lake Washington: (1) mean run size and (2) brood escapement times return rate. Proportion of hatchery and natural forecast for McAllister (see method for hatchery). Age-specific return rates times brood releases for Area 10E.
	Hatchery	67.8	65.1[b/]	51.9	49.6 (74.5)	52.7 (46.2)	1994 brood release times average return rate for: Lake Washington, Puyallup, Minter, and McAllister. Mean run size for Chambers Creek, Nisqually and Coulter Creek. Average of 2 different methods for Green River: (1) specific age-1 outmigration return rates times brood releases and (2) regressions of returns to age-2 fingerlings and to yearling releases. For Area 10E, age-specific return rates times brood releases. Average of mean run size and brood release times return rate for Deschutes.
Hood Canal	Natural and Hatchery	6.7	2.7	9.0	3.9 (9.0)	11.4 (3.8)	Average of 1993-1997 returns per brood fingerling releases, times brood fingerlings released.
Strait of Juan de Fuca	Natural	0.9	0.8	0.9	0.9 (0.9)	1.0 (0.5)	1986-1996 mean run size for Hoko. 1992-1997 mean run size for Dungeness.
	Hatchery	1.7	2.2	2.8	3.0 (1.9)	3.9 (1.6)	1993-1997 mean run size.

a/ Forecast is Puget Sound run size available to U.S. net fisheries. Does not include fish caught in troll and recreational fisheries. Postseason estimates not available for 1996.

b/ The Muckleshoot Tribe's Green River Hatchery chinook forecast is 10,857 based on the 1990-1995 average hatchery return to Area 10A. This results in a South Sound hatchery estimate of 58,000 fish.

TABLE I-2. Preliminary, preseason **adult coho** salmon stock ocean abundance forecasts in thousands of fish. (Page 1 of 2)

Production Source and Stock or Stock Group		Preseason Estimates of Adults (Postseason Estimates in Parentheses) 1998	1997	1996	1995	1994	Methodology for 1998 Prediction
All OPI Area Stocks (California and Oregon Coasts and Columbia River)		165.8	463.8 (239.7)	372.8 (286.6)	369.8 (214.6)	197.6 (250.9)	Sum of stock component estimates.
OPI Public Hatchery		118.4	376.1 (215.3)	309.2 (182.6)	301.5 (145.6)	147.5 (203.9)	Multiple linear regression of OPI public hatchery jacks to adults adjusted for Columbia River delayed smolt release, data base 1970-1997 and adjusted to SRS accounting. Public hatchery prediction is partitioned into Columbia River early and late, and coastal stocks based on the percent of jacks observed and recent year average stock specific maturation rates.
Columbia River Early		63.8	206.9 (129.8)	142.2 (98.0)	196.8 (74.4)	57.5 (141.5)	
Columbia River Late		24.9	86.5 (53.7)	114.4 (30.8)	61.3 (22.5)	53.1 (33.2)	
Coastal		29.7	82.7 (31.8)	52.7 (53.8)	43.4 (48.7)	36.9 (29.2)	
OCN		47.2	86.4 (24.1)	63.2 (102.9)	60.0 (65.5)	49.3 (45.2)	For river production, relates ocean recruits (SRS Accounting) to upwelling, sea surface temperature; data base 1970-1997. Most recent 3-year average abundance for lake production.
STEP		0.2	1.3 (0.3)	0.4 (1.2)	8.3 (0.5)	0.8 (1.8)	Smolt production with 1996 smolt to adult survival rates adjusted by changes in OPI public hatchery jacks per smolt between 1996 and 1995 release years and adjusted to SRS accounting.
Washington Coast							
Willapa	Natural	3.3	-	-	-	-	
	Hatchery	20.8	72.5	72.1	50.4	12.6	Regression of 1992-1997 terminal run size and jack returns.
Grays Harbor	Natural	30.1	26.1	121.4	103.4	53.8-60.7	1995 brood escapement times average return per spawner, adjusted by smolt production estimates and jack return rate.
	Hatchery	25.6	104.3	95.7	108.1	35.2-41.3	Smolt releases times expected marine survivals based on jack return rates.
Quinault	Natural	6.5	2.0	4.9	10.3	9.6	1990-1994 brood year average ocean recruits per spawner, adjusted for expected reduced survival.
	Hatchery	3.9	5.1	14.0	11.6	7.4	1993-1994 average brood year to adult survival rate applied to release. Includes supplementation releases.
Queets	Natural	5.6	4.3	8.3	12.1	6.9	Lowest brood year smolt to adult survival rate from the 1980-1994 brood years applied to 1995 brood year smolt estimate. Includes supplementation releases. Supplemental production lowest brood year smolt to adult survival rate since 1985 brood year applied to 1995 brood year release.
	Hatchery	4.6	16.9	28.1	21.9	8.1	Lowest brood year smolt to adult survival rate since 1983 applied to 1995 brood year release.
Hoh	Natural	3.4	2.8	4.2	6.8	5.0	Average Queets and Clearwater smolts per square mile multiplied by 299 square miles of Hoh River watershed. Queets smolt production adjusted by Hoh drainage area and seeding level differences, and by ocean survival based on Bingham Creek and Queets survivals.
	Hatchery	0.0	0.0	0.0	0.0	0.0	No releases since the 1989 brood.

TABLE I-2. Preliminary, preseason **adult coho** salmon stock ocean abundance forecasts in thousands of fish. (Page 2 of 2)

Production Source and Stock or Stock Group		Preseason Estimates of Adults (Postseason Estimates in Parentheses) 1998	1997	1996	1995	1994	Methodology for 1998 Prediction
Quillayute Fall Run	Natural	8.0	8.9	13.0	13.1	11.6	Average recruits per spawner multiplied by the 1995 spawner escapement, reduced by 70% based on low jack return rates.
	Hatchery	4.4	9.1	13.9	7.6	6.5	Mean ocean recruits per release, multiplied by releases, reduced by 70% based on low jack return rates.
Quillayute Summer Run	Natural	1.3	1.6	0.9	3.1	1.4	Regression of ocean recruits against brood year escapement, reduced by 70% based on low jack return rates.
	Hatchery	1.8	3.6	5.1	2.1	2.2	Average ocean recruits per release, multiplied by the number of smolts released, reduced by 70% based on low jack return rates.
Puget Sound[a/]							b/
Strait	Natural	16.8	6.5	10.7	11.4	20.8	
	Hatchery	28.3	29.7	38.2	40.5	35.6	
Nooksack-Samish	Natural	30.8	28.0	55.8	42.6	58.3	
	Hatchery	119.1	223.3	328.9	280.5	307.9	
Skagit	Natural	55.0	70.9	44.8	64.7	39.0	
	Hatchery	12.9	22.1	45.2	41.2	48.4	
Stillaguamish	Natural	47.8	36.0	51.6	70.3	21.9	
Snohomish	Natural	165.3	186.6	338.1	358.3	256.7	
	Hatchery	47.1	184.6	212.9	228.0	235.8	
South Sound	Natural	57.2	135.0	142.5	127.1	112.3	
	Hatchery	408.7	674.1	659.9	488.1	553.9	
Hood Canal		108.0	78.4	25.1	36.4	25.4	
Natural	Hatchery	95.2	66.3	59.6	58.9	84.0	

a/ Run sizes scaled to FRAM base period (1979-1981) catch and escapement.

b/ A variety of methods were used for 1998, primarily based on smolt production and survival. See text and "1998 Puget Sound Coho Salmon Forcast Methodology" report for details.

CHAPTER II
CHINOOK SALMON ASSESSMENT

SACRAMENTO RIVER FALL CHINOOK SALMON

Predictor Description

The Council's framework amendment escapement goal for Sacramento River fall chinook is a range of 122,000 to 180,000 adults. The fall stock comprises over 90% of the escapement of all chinook stocks utilizing Central Valley streams and hatcheries. The Central Valley index (CVI) has been developed as an index of abundance for the combined Central Valley chinook stocks. The CVI is computed as the sum of ocean fishery chinook harvests in the area south of Point Arena and the Central Valley spawning escapement of adult chinook in the same year (Table II-1).

Prior to 1989, the Salmon Technical Team (STT) based its projection of the CVI on recent CVI levels (with general consideration given for brood year natural escapements), hatchery releases, and the previous year jack runs. Beginning in 1989 and continuing through 1991, the CVI definition was modified to exclude spawning escapements of Sacramento River winter chinook and several possible predictors were analyzed, including pounds or number of juveniles in hatchery releases and previous year jack returns. As a result of the analyses, the STT has used the relationship between the Central Valley jack estimate for the previous year compared to the total CVI abundance of adults as the best indicator for CVI abundance since 1991.

Predictor Performance

The preseason point projections for the CVI from 1985-1988 ranged from 58% to 79%, and averaged 66% of the postseason CVI estimates (Table II-2). Prior to the El Niño years of 1983-1984, the CVI had been relatively stable, but from 1985-1988 it increased significantly.

The 1997 abundance index projection for the CVI of 849,000 fish was based on the jack to CVI relationship from 1987 to 1996. The postseason estimate for the 1997 CVI was 1,046,200 fish; approximately 23% greater than the preseason projection. The postseason estimate of 64% for the Central Valley ocean harvest index was six percent higher than the preseason projection of 58%.

1998 Stock Status

The CVI projection for 1998, based on the jack to CVI relationship using the most recent ten years (1988-1997), is 1,051,000 adult chinook, somewhat higher than in 1997 (Figure II-1).

Evaluation of 1997 Regulations on 1998 Stock Abundance

The ocean harvest index for the Central Valley (ocean harvest landed south of Point Arena as a percent of the CVI abundance) has varied significantly since it was first calculated in 1970. After reaching its lowest level in 1985 (50%), the index rose to 78% in 1988 and ranged from 71% to 79% over the 1989-1995 period (Table II-1). However, harvest constraints for the 1996 season, instituted south of Point Arena to increase the 1997 escapement of the endangered Sacramento River winter chinook, resulted in a decrease of the ocean harvest index to 64% in 1996. The easing of harvest constraints for the 1997 season, because of better-than-expected 1997 winter chinook escapement, resulted in a 1997 ocean harvest index of 66%.

Regulations comparable to 1997 would continue to constrain effort levels in the fisheries south of Point Arena. The expectation is that a repeat of 1997 regulations will result in an ocean harvest index similar to that observed in 1997. Given the CVI abundance projection of 1,051,000 fish, the escapement for Sacramento River fall chinook would be expected to be well above the upper end of the escapement goal range (Figure II-2).

TABLE II-1. Indices of annual abundance and ocean fishery impacts on California Central Valley chinook in thousands of fish. (Page 1 of 1)

Year	Ocean Chinook Landings South of Pt. Arena			Hatchery and Natural Escapements of Central Valley Adults			Abundance Index (Ocean + River Totals)	Ocean Harvest Index (%)[b/]
	Troll	Sport	Total	Fall	Other[a/]	Total		
1970	226.8	111.1	337.9	190.5	55.6[c/]	246.1	584.0	58
1971	150.7	166.3	317.0	190.6	62.0	252.6	569.6	56
1972	229.8	187.6	417.4	99.6	46.1	145.7	563.1	74
1973	422.5	180.9	603.4	227.1	27.1	254.2	857.6	70
1974	282.7	141.6	424.3	205.6	35.7	241.3	665.6	64
1975	234.4	92.7	327.1	159.2	47.6	206.8	533.9	61
1976	237.9	68.6	306.4	168.8	43.8	212.6	519.0	59
1977	263.8	76.6	340.4	148.7	42.8	191.5	531.9	64
1978	291.0	65.9	356.9	136.9	17.1	154.0	510.9	70
1979	234.1	108.5	342.6	167.9	11.3	179.2	521.8	66
1980	294.3	77.1	371.4	155.9	31.6	187.5	558.9	66
1981	289.9	73.8	363.7	189.3	18.7	208.0	571.7	64
1982	418.4	122.5	540.9	177.2	36.8	214.0	754.9	72
1983	178.2	53.0	231.2	121.0	14.2	135.2	366.4	63
1984	221.7	78.7	300.3	197.5	17.6	215.1	515.4	58
1985	212.3	121.8	334.1	308.9	19.0	327.9	662.0	50
1986	502.5	114.8	617.3	259.0	30.3	289.3	906.6	68
1987	446.8	152.8	599.7	188.0	25.2	213.2	812.9	74
1988	830.5	130.4	960.9	244.9	23.3	268.2	1,229.1	78
1989	363.8	130.9	494.7	149.6	16.4	166.0	660.7	75
1990	336.2	112.6	448.8	108.3	13.5	121.8	570.6	79
1991	254.6	62.1	316.7	112.3	15.1	127.4	444.1	71
1992	163.5	66.7	230.2	85.3	7.6	92.9	323.1	71
1993	259.7	99.3	359.0	131.5	10.1	141.6	500.6	72
1994	290.4	159.9	450.3	148.8	11.2	160.0	610.3	74
1995	665.5	354.6	1,020.1	272.0	19.9[d/]	291.9	1,312.0	78
1996	348.9	129.3	478.2	255.3	8.1	263.4	741.6	64
1997[e/]	482.3	208.2	690.5	350.9	4.8	355.7	1,046.2	66

a/ Spring run of the current calendar year and late fall and winter runs of the following calendar year.
b/ Ocean harvest landed south of Pt. Arena as a percent of the abundance index.
c/ Percent of adults in 1970 spring run assumed the same as 1971 (72%, 5,500 total).
d/ Winter run assumed to be the same as previous year.
e/ Preliminary.

TABLE II-2. Comparisons of preseason and postseason estimates for the CVI in thousands of chinook salmon. (Page 1 of 1)

Year or Average	Preseason	Postseason	Preseason/Postseason
1985-1988	592.8	902.6	0.66
1985	524.8	662.0	0.79
1986	546.5	906.6	0.60
1987	592.9	812.9	0.73
1988	707.1	1,229.1	0.58
1989	625-885	660.7	0.95-1.34
1990	500-900	570.6	0.88-1.58
1991	466	444.1	1.05
1992	452	323.1	1.40
1993	501	500.6	1.00
1994	503	610.3	0.82
1995	654	1,312.0	0.50
1996	533	741.6	0.72
1997	849	1,046.2	0.81

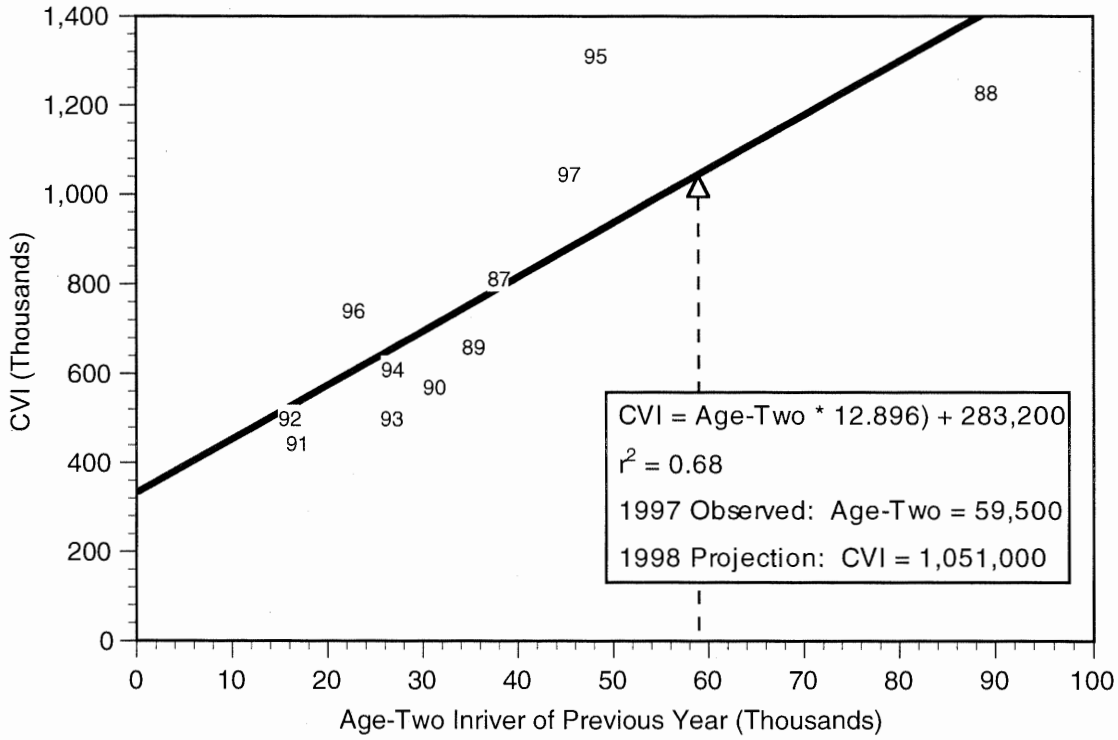

FIGURE II-1. Linear regression of CVI on inriver age-two Central Valley chinook of the previous year, 1987-1997. Years shown are CVI year.

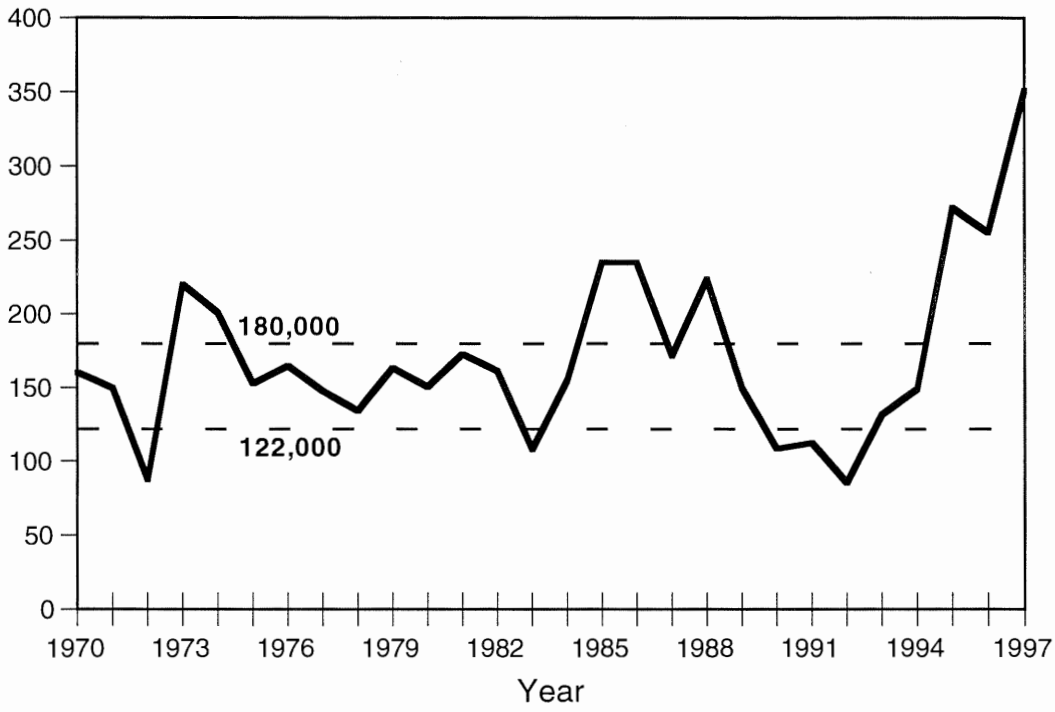

FIGURE II-2. Spawning escapements of adult Sacramento River fall chinook, 1970-1997, and the goal range for the stock of 122,000 to 180,000 adult fish (1997 estimate is preliminary).

KLAMATH RIVER FALL CHINOOK

Predictor Description

For Klamath River fall chinook, linear regression beginning with the 1979 brood year has been used to relate ocean population size estimates for age-three and age-four fish prior to the ocean fishing season to inriver run size estimates of age-two and age-three fish, respectively, of the previous year (Table II-3). Since 1986, a variety of regression models have been employed to relate these data. Particularly in years of low abundance, the regression models used by the Council overpredicted stock size, and have been partially responsible for the resulting low escapements observed in the early 1990s. This bias was of less concern in 1996, because relatively high numbers of age-two and very high numbers of age-three fish returned to the river in 1995.

For 1998, the age-three and age-four ocean populations are based on all years of data from cohort reconstructions using coded-wire tag (CWT) and river run estimates, with the regression line run through the zero intercept. This produces projections of ocean stock size that fit the assumption that low escapement of a particular age class in one year generally results in low ocean abundance of the same brood the following year and provides for a single straight line relationship over the entire data range.

Ocean fisheries harvest small numbers of age-two and age-five Klamath River fall chinook. The abundance of age-two fish was not projected, because no precursor to age-two fish of that brood is available. The abundance of age-five fish was projected, by multiplying the age-four ocean cohort size remaining at the end of the 1997 season (determined by dividing the age-four river run size by the average maturity rate for the stock of approximately 93% and then subtracting the river run) by the over-winter survival rate of 80%, assumed in the cohort reconstruction process.

Predictor and Fishery Performance

The preseason ocean abundance projections for age-three fish, since 1985, have ranged from 30% to 211% of the postseason estimates using the Klamath River Technical Advisory Team (KRTAT) cohort reconstruction method (Table II-4). The age-four preseason projections for these same years ranged from 58% to 304% of the postseason estimates. For years of low stock abundance, particularly 1991-1994, the regression models generally have overpredicted stock size. The Klamath River regression models have been updated each year using the revised data points for age-three and age-four fish and the postseason estimate for the age-two and age-three fish of the previous year. The 1997 age-three preseason projection was 15% more than the postseason estimate, while the age-four projection was about 14% less than the postseason estimate (Table II-4).

Management of Klamath River fall chinook harvest since 1986 has been guided by attaining specific harvest rates on fully vulnerable age-four and age-five fish in ocean and river fisheries (Table II-5). The Council has used a combination of quotas and time/area restrictions in ocean fisheries in an attempt to meet the age-four harvest rate goal set each year. Since 1992, fisheries have been managed to achieve 50/50 allocation between tribal and non-tribal fisheries. River fisheries have been managed on adult chinook quotas (tribal net fishing) or partial quotas which trigger area closures (recreational fishing).

The Council's framework plan goal for Klamath River fall chinook (Amendment 9) is to achieve a 33% to 34% natural escapement rate for each brood of fish, except that a minimum escapement of 35,000 natural adults is to be protected in all years. The amendment allows for any ocean and inriver allocation which meets the escapement rate goal if it also meets the minimum escapement floor. The regulations adopted in 1997 by the Secretary of Commerce were estimated preseason to provide an inriver escapement of 77,700 adult fish and an ocean exploitation rate on age-four fish of 12%. Ocean fisheries in 1997 are estimated to have harvested age-four Klamath River fall chinook at a rate of eight percent (Table II-6).

TABLE II-3. Estimated number of fall chinook salmon by age entering the Klamath River in thousands of fish, including estimates of ocean population sizes.[a/] (Page 1 of 1)

	Inriver Population by Age					Ocean Exploitation Rate by Age		Ocean Population by Age		
Return Year	Age-2	Age-3	Age-4	Age-5	Total Adults	Age-3	Age-4	Age-3	Age-4	Total
1981	28.1	64.0	14.3	1.8	80.1	0.42	0.66	246.6	45.6	292.2
1982	39.4	30.0	33.9	2.6	66.5	0.57	0.65	344.5	106.7	451.2
1983	3.8	35.8	20.7	0.9	57.5	0.28	0.70	103.8	84.9	188.7
1984	8.3	29.6	15.2	2.3	47.1	0.14	0.43	103.0	29.1	132.1
1985	69.4	30.7	32.7	0.9	64.4	0.25	0.29	138.0	46.0	184.0
1986	44.5	167.9	26.9	b/	194.8	0.32	0.52	604.1	56.1	660.2
1987	19.0	120.7	88.0	b/	208.7	0.38	0.53	415.4	192.9	608.4
1988	24.0	136.5	53.5	1.2	191.3	0.39	0.45	612.2	108.7	720.9
1989	9.1	15.2	105.6	3.2	124.0	0.22	0.44	129.7	190.0	319.7
1990	4.4	9.1	26.6	0.2	35.8	0.61	0.61	113.3	68.7	182.0
1991	1.8	14.4	18.1	0.1	32.6	0.10	0.21	43.9	24.8	68.7
1992	13.7	7.3	18.3	1.0	26.7	0.02	0.04	20.8	20.0	40.8
1993	7.6	48.5	8.1	0.6	57.1	0.11	0.11	97.7	10.4	108.1
1994	14.4	35.6	25.0	1.0	61.6	0.05	0.07	69.0	30.3	99.3
1995	22.8	194.1	17.2	2.4	213.7	0.10	0.21	456.2	23.6	479.7
1996	9.5	38.5	136.6	0.3	175.4	0.12	0.16	115.4[c/]	172.2	287.6
1997	9.6	34.1	43.2	4.5	81.7	d/	0.08	98.0[c/]	50.2[c/]	148.3

a/ Ocean exploitation rate and ocean population size for age-three fish in 1981 and age-four fish in 1981 and 1982 from CDFG; all others from KRTAT.
b/ Less than 50 fish.
c/ This is a preliminary estimate based on average maturity rates as the cohort has not completed its life cycle.
d/ Cannot compute for incomplete cohort.

TABLE II-4. Comparisons of preseason and postseason ocean abundance estimates for age-three and age-four Klamath River fall chinook. (Page 1 of 1)

Age	Season	Preseason Estimate	Postseason Estimate	Pre/Postseason
3	1985	56,500	138,000	0.41
	1986	213,000[a/]	604,100	0.35
	1987	255,900	415,400	0.62
	1988	185,400	612,200	0.30
	1989	225,300	129,700	1.74
	1990	239,500	113,300	2.11
	1991	88,100	43,900	2.01
	1992	25,000	20,800	1.20
	1993	147,200	97,700	1.51
	1994	69,000	69,000	1.00
	1995	134,500	456,200	0.30
	1996	244,000	115,400[b/]	2.11
	1997	112,300	98,000[b/]	1.06
4	1985	45,500	46,000	0.91
	1986	53,000	56,100	0.94
	1987	164,900	192,900	0.85
	1988	149,100	108,700	1.37
	1989	172,400	190,000	0.91
	1990	40,100	68,700	0.58
	1991	35,700	24,800	1.44
	1992	35,800	20,000	1.79
	1993	31,300	10,400	3.04
	1994	68,600	30,300	2.26
	1995	37,600	23,600	1.59
	1996	214,800	172,200	1.25
	1997	43,100	50,200[b/]	0.86

a/ A 75% jack count adjustment was applied, because most of the jacks were in the Trinity River. Also, the Klamath River Basin jack count was outside the data base.

b/ This is a preliminary estimate, as the cohort has not completed its life cycle.

TABLE II-5. Summary of management objectives and performance for Klamath River fall chinook. (Page 1 of 1)

	Preseason Stock Abundance Projection		Postseason Stock Abundance Estimate		Preseason Impact Rate Target on Age-four Fish[a/]		Actual Impact Rate on Age-four Fish[b/]		Adult Numerical Preseason Harvest Target		Adult Actual Numerical Harvest	
Year	Age-3	Age-4	Age-3	Age-4	Ocean	River	Ocean	River	Ocean	River	Ocean	River
1986	213,000	53,000	604,100	56,100	0.350	0.500	0.52	0.74	72,000	37, 700	224,100	46,200
1987	255,900	164,900	415,400	192,900	0.350	0.525	0.53	0.56	121,200	78,200	260,900	73,300
1988	185,400	149,100	612,200	108,700	0.390	0.525	0.45	0.84	114,100	65,400	287,200	73,900
1989	225,300	172,400	129,700	190,000	0.375	0.490	0.44	0.46	128,100	67,600	112,200	54,300
1990	239,500	40,100	113,300	68,700	0.375	0.490	0.61	0.31	85,100	31,200	110,800	11,500
1991	88,100	35,700	43,900	24,800	0.160	0.280	0.21	0.49	16,700	12,800	9,400	13,600
1992	25,000	35,800	20,700	20,000	0.080	0.150	0.04	0.26	4,100	5,700	1,400	6,800
1993	147,200	31,300	97,100	10,300	0.145	0.427	0.11	0.50	20,300	21,200	11,700	12,800
1994	69,000	68,600	69,000	30,300	0.090	0.200	0.07	0.30	10,400	13,200	5,800	13,500
1995	134,500	37,600	456,200	23,600	0.090	0.320	0.21	0.10	13,500	17,100	48,700	21,600
1996	244,000	214,800	115,400	172,200	0.210	0.660	0.16	0.39	88,400	119,800	41,600	69,200
1997[c/]	112,300	43,100	105,700	50,200	0.120	0.430	0.08	0.24	17,600	26,500	8,700	16,100

a/ Ocean impact rate target expressed as fraction of ocean stock projection. River impact rate target expressed as fraction of fish projected to enter the river.
b/ Ocean impact rate expressed as fraction of ocean stock abundance. River impact rate expressed as fraction of fish entering the river.
c/ Preliminary.

TABLE II-6. Harvest levels and rates of age-three and age-four Klamath River fall chinook (biological years are defined as September 1 through August 31 for ocean fisheries). (Page 1 of 1)

	Ocean Fisheries							River Fisheries[a/]		
	KMZ			North of	South of		Ocean			
Year	Troll	Sport	Subtotal	KMZ	KMZ	Subtotal	Total	Net	Sport	Total
HARVEST LEVELS (thousands of fish)										
Age-three										
1986	30.0	3.8	33.8	58.1	103.1	161.2	195.0	8.1	18.1	26.2
1987	24.8	6.0	30.9	43.5	84.5	127.9	158.8	11.4	11.4	22.8
1988	29.7	7.6	37.4	44.7	156.2	200.9	238.2	12.5	15.6	28.1
1989	0.7	5.3	6.0	12.2	10.3	22.5	28.6	2.7	0.9	3.6
1990	1.2	8.2	9.5	40.4	18.9	59.3	68.7	1.3	1.4	2.7
1991	0.0	0.4	0.4	0.3	3.5	3.8	4.2	2.1	2.1	4.2
1992	0.0	0.0	0.0	0.5	0.0	0.5	0.5	1.0	0.6	1.6
1993	0.0	1.0	1.0	1.0	8.7	9.6	10.6	5.4	3.4	8.8
1994	0.1	0.3	0.3	0.0	3.4	3.4	3.7	4.5	1.0	5.5
1995[b/]	0.0	1.5	1.5	19.5	22.9	42.4	43.9	14.1	5.5	19.7
1996[b/]	0.1	0.4	0.5	0.2	12.6	12.8	13.2	12.4	2.6	15.0
1997[b/]	0.0	0.8	0.8	1.4	2.6	4.0	4.8	2.1	2.1	4.2
Age-four										
1986	3.6	0.5	4.1	12.1	12.9	25.0	29.1	17.0	2.9	19.9
1987	13.8	3.0	16.8	48.5	36.8	85.3	102.1	41.0	8.5	49.5
1988	6.0	2.9	8.9	12.4	27.7	40.1	49.0	38.6	6.2	44.8
1989	12.4	13.1	25.5	33.9	24.2	58.1	83.6	41.0	7.7	48.7
1990	1.1	2.8	4.0	29.4	8.7	38.1	42.0	6.0	2.2	8.2
1991	0.1	0.7	0.7	0.7	3.7	4.5	5.2	7.6	1.2	8.8
1992	c/	c/	0.1	0.7	0.1	0.8	0.9	4.4	0.3	4.7
1993	0.0	0.0	0.0	0.4	0.8	1.1	1.1	3.8	0.2	4.0
1994	c/	0.6	0.6	0.4	1.0	1.5	2.1	6.7	0.8	7.5
1995[b/]	0.0	0.1	0.1	2.2	2.5	4.7	4.8	1.3	0.5	1.7
1996[b/]	0.8	1.1	1.9	6.9	19.6	26.5	28.4	44.0	9.9	53.9
1997[b/]	0.2	0.7	0.9	1.1	1.8	3.0	3.9	8.5	1.9	10.4
HARVEST RATE										
Age-three										
1986	0.01	0.01	0.06	0.10	0.17	0.27	0.32	0.05	0.11	0.16
1987	0.06	0.01	0.07	0.10	0.20	0.31	0.38	0.09	0.09	0.19
1988	0.05	0.01	0.06	0.07	0.26	0.33	0.39	0.09	0.11	0.21
1989	0.01	0.04	0.05	0.09	0.08	0.17	0.22	0.18	0.06	0.24
1990	0.01	0.07	0.08	0.36	0.17	0.52	0.61	0.14	0.15	0.30
1991	0.00	0.01	0.01	0.01	0.08	0.09	0.10	0.29	0.29	0.57
1992	0.00	0.00	0.00	0.02	0.00	0.02	0.02	0.14	0.08	0.22
1993	0.00	0.01	0.01	0.01	0.09	0.10	0.11	0.11	0.07	0.18
1994	c/	c/	0.01	0.00	0.05	0.05	0.05	0.13	0.03	0.15
1995[b/]	0.00	c/	c/	0.04	0.05	0.09	0.10	0.07	0.03	0.10
1996[b/]	c/	c/	c/	c/	0.11	0.11	0.12	0.32	0.07	0.39
1997[b/]	0.00	0.01	0.01	0.01	0.02	0.04	0.05	0.06	0.06	0.12
Age-four										
1986	0.06	0.01	0.07	0.22	0.23	0.45	0.52	0.63	0.11	0.74
1987	0.07	0.02	0.09	0.25	0.19	0.44	0.53	0.47	0.10	0.56
1988	0.05	0.03	0.08	0.11	0.25	0.37	0.45	0.72	0.12	0.84
1989	0.07	0.07	0.13	0.18	0.13	0.31	0.44	0.39	0.07	0.46
1990	0.02	0.04	0.06	0.43	0.13	0.55	0.61	0.23	0.08	0.31
1991	c/	0.03	0.03	0.03	0.15	0.18	0.21	0.42	0.07	0.49
1992	c/	c/	0.01	0.03	c/	0.04	0.04	0.24	0.02	0.26
1993	0.00	0.00	0.00	0.04	0.07	0.11	0.11	0.47	0.02	0.50
1994	c/	0.02	0.02	0.01	0.03	0.05	0.07	0.27	0.03	0.30
1995[b/]	0.00	0.01	0.01	0.09	0.11	0.20	0.21	0.07	0.03	0.10
1996[b/]	c/	0.01	0.01	0.04	0.11	0.15	0.16	0.32	0.07	0.39
1997[b/]	0.01	0.01	0.02	0.02	0.04	0.06	0.08	0.20	0.04	0.24

a/ Net fishery estimates provided by Yurok and Hoopa Tribes. Sport fishery estimates provided by CDFG.
b/ Preliminary data.
c/ Harvest level less than 50 fish or harvest rate less than 0.005.

1998 Stock Status

The age-three projection of 88,000 fish is about 78% of the 1997 preseason projection of 112,300 fish (Figure II-3 and Table II-4). The age-four projection of 36,800 fish is about 85% of the 1997 preseason projection of 43,100 fish (Figure II-4 and Table II-4).

Late-season (September through November) ocean fisheries in 1997 are estimated to have harvested zero age-three and 266 age-four Klamath River fall chinook. These fish should be deducted from the ocean allocation in determining the actual allowable ocean harvest level in 1998.

In the absence of ocean and river fisheries in 1998, the projected stock strength, in conjunction with the average maturity rates observed for the 1979-1992 broods (38%, 93%, and 100% for age-three, age-four, and age-five fish, respectively), would produce a 1998 spawning population of 49,400 adults. In 1997, 71% of the adults spawned in natural areas even though both basin hatcheries allowed free access to fish attempting to enter these facilities. This high proportion of adults in natural areas in 1997 is comparable to 84% of spawners that spawned outside of the hatcheries in 1995. Fishing levels (ocean and river combined) that provide a 33% to 34% escapement rate would produce a 1998 spawning population of 26,900 adult fish, at least 19,100 of which would be expected to spawn in natural areas. Estimates of age-three and age-four ocean abundances for 1998 will require ocean and river age-four harvest rates comparable to those between 1992-1994 to meet the 35,000 adult natural spawner floor.

Evaluation of 1997 Regulations on 1998 Stock Abundance

The Klamath Ocean Harvest Model (KOHM) has not yet been updated to evaluate 1998 ocean fishery options. The KOHM was developed for use in evaluating 1988 ocean fishery options and has been updated each year thereafter. When the model is calibrated for 1998, it will be calibrated to the average 1986-1990 fishery observations and expected 1998 stock strengths for Klamath, Central Valley, and Rogue River chinook. A precise estimate of 1997 regulation impacts on 1998 stock projections for Klamath River fall chinook is not possible at this time. Nonetheless, overall ocean impacts would be expected to be somewhat below the rate allowed by the Council's fishery management plan and the current allocation of harvestable fish, as the age-four exploitation rate in ocean fisheries in 1997 was 12%.

OTHER CALIFORNIA COASTAL CHINOOK STOCKS

Other California streams that contribute to ocean fisheries include the Smith, Little, Mad, Eel, and Mattole Rivers, and Redwood Creek. All of these streams support fall stocks and are believed to contribute to ocean fisheries primarily off the California and Oregon coasts. Information is insufficient to forecast ocean abundance levels for these stocks.

OREGON COASTAL CHINOOK STOCKS

Oregon coastal chinook stocks are categorized into two major subgroups based on ocean migration patterns. Although their ocean harvest distributions somewhat overlap, they have been labeled as either north or south/local migrating.

Oregon Coastal North Migrating Chinook

North migrating chinook stocks include stocks north of and including the Elk River, with the exception of Umpqua River spring chinook. Based on CWT analysis, the populations from ten major north Oregon coast (NOC) river systems from the Nehalem through the Siuslaw Rivers are harvested primarily in Pacific Salmon Commission (PSC) ocean fisheries off British Columbia and southeast Alaska and to a much lesser degree in Council area fisheries off Washington and Oregon, primarily in terminal area fisheries. CWT analysis indicates that populations from five major mid-Oregon coast (MOC) systems from the Coos through the Elk Rivers are harvested primarily in ocean fisheries off British Columbia, Washington, and Oregon, with minor contributions to California fisheries.

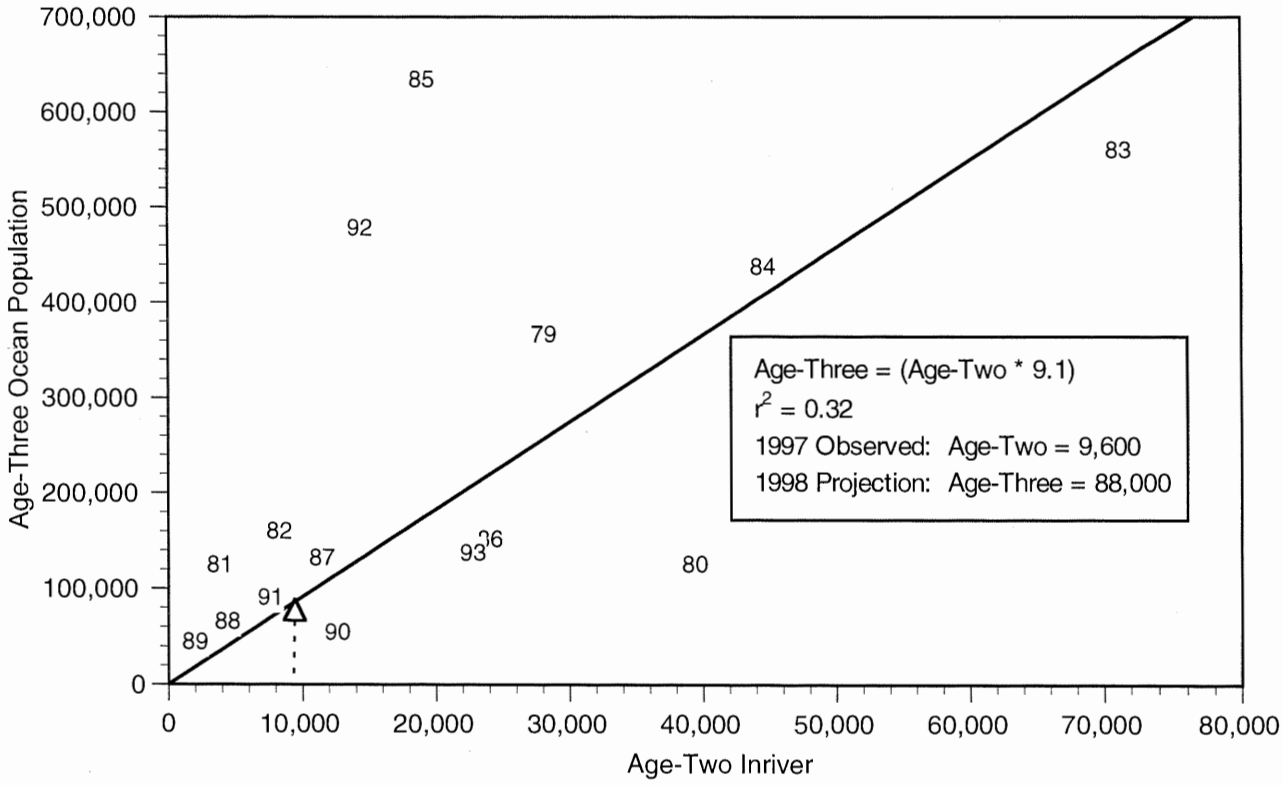

FIGURE II-3. Linear regression of ocean age-three on inriver age-two Klamath River fall chinook of the same cohort, 1979-1993 broods (years shown are brood years).

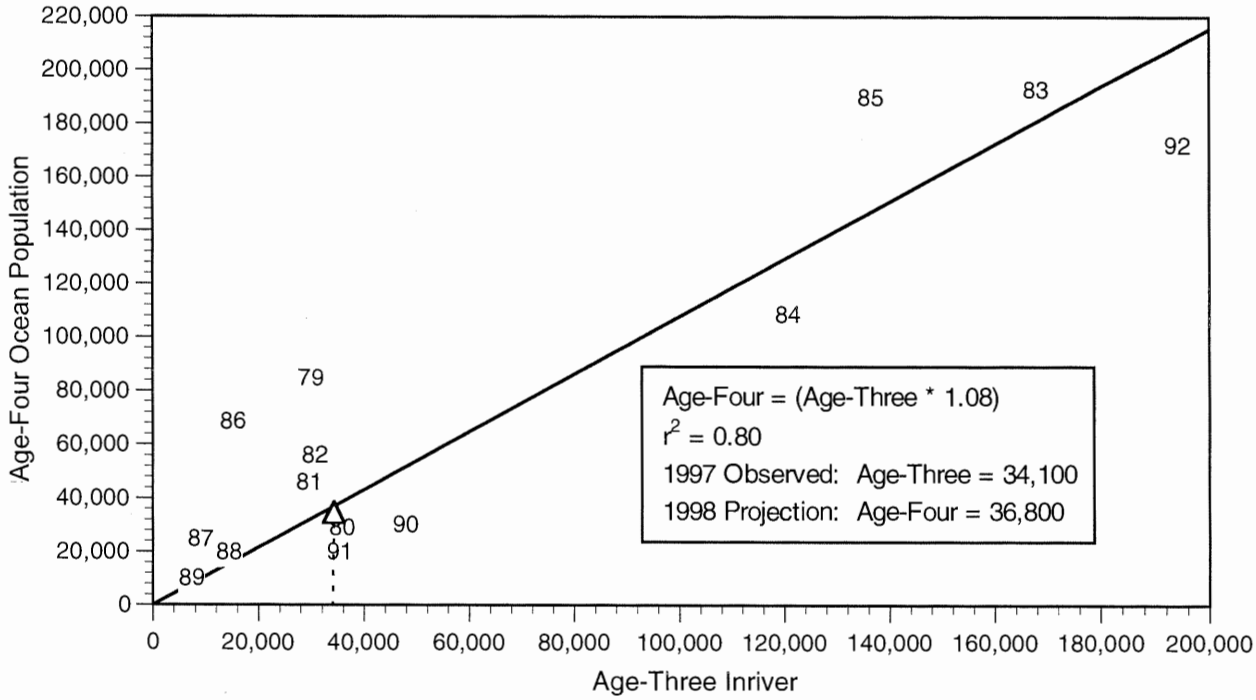

FIGURE II-4. Linear regression of ocean age-four on inriver age-three Klamath River fall chinook of the same cohort, 1979-1993 broods (years shown are brood years).

Predictor Description and 1998 Stock Status

Specific techniques have not been developed to make quantitative abundance predictions for these stocks for use in annual development of Council area fishery regulations. Qualitative expectations are based on parental year spawner escapement and recently developed hatchery indicator stocks for use in the PSC management process.

Natural spawner escapement is assessed yearly from the Nehalem through Coquille Rivers. Peak spawning counts of adults are obtained from standard index areas on these rivers and monitored to assess stock trends (Review of 1997 Ocean Salmon Fisheries, Chapter II, Table II-4 and Figure II-3). Natural fall chinook stocks from the Nehalem River on the north Oregon coast south to the Elk River near Humbug Mountain dominate production from this subgroup. Also present in lesser numbers are naturally-produced spring chinook stocks from several rivers and hatchery fall and/or spring chinook produced in the Trask, Nestucca, Salmon, Alsea, and Elk Rivers.

North Oregon Coast (NOC)

Since 1986, the Salmon River Hatchery production has been coded-wire-tagged and used as an indicator stock for the NOC stock component. The STT has not reviewed the procedure from which this indicator stock is used in estimating annual stock status, because these fish are mostly harvested in PSC fisheries. Based on this indicator stock and compared with index abundances since 1986, the STT is informed that expectations in 1998 are for an above average abundance of age-five fish and a below average abundance of age-three and age-four fish.

Mid-Oregon Coast (MOC)

Since 1992, the Elk River Hatchery production has been coded-wire-tagged for use as an indicator stock for the MOC stock component. Forecasts of abundance assume that river returns of younger age classes of a brood reflect abundance of the remaining, as yet immature, ocean residents of the brood. Age-specific ocean escapements for 1997 are not currently available. The STT has not undertaken a review of the methods used by state staff in preparing these abundance forecasts.

Based on the density index of total spawners, the generalized expectation for ocean coastal north migrating (NOC & MOC) stocks in 1998 is for average to below average abundance. The density of adult spawners per mile observed since 1985 are a primary indicator that these stocks are generally healthy.

South/Local Migrating Chinook

South/local migrating chinook stocks include Rogue River spring and fall chinook and fall chinook from smaller rivers south of the Elk River. These stocks are important contributors to ocean fisheries off Oregon and northern California. Another central Oregon stock, Umpqua River spring chinook, contributes primarily to ocean fisheries off Oregon and California and to a lesser degree, off Washington, British Columbia, and southeast Alaska.

Predictor Description and 1998 Stock Status

Quantitative abundance predictions are not made for these stocks, although an abundance index for Rogue River fall chinook has been developed. General trends in stock abundance for southern Oregon coastal chinook stocks are assessed through escapement indices (Review of 1997 Ocean Salmon Fisheries, Chapter II, Table II-4 and Figures II-3 and II-4).

Natural fall chinook stocks from river systems south of the Elk River and spring chinook stocks from the Rogue and Umpqua Rivers dominate production from this subgroup. Also present in lesser numbers are hatchery fall chinook with the majority of releases occurring in the Chetco River. Substantial releases of hatchery spring chinook occur in both the Rogue and Umpqua Rivers.

Umpqua River and Rogue River Spring Chinook

Umpqua and Rogue Rivers spring chinook contribute to ocean fisheries primarily as age-three fish. Mature chinook enter the rivers primarily during April and May and generally prior to annual fisheries. Quantitative abundance predictions are not made for these stocks.

Rogue River Fall Chinook

Rogue River fall chinook contribute to ocean fisheries principally as age-three through age-five fish. Mature fish enter the river each year from mid-July through October, with the peak run occurring during August and September.

Annual predictions of Rogue River fall chinook are used for the purposes of ocean impact modeling and, specifically, for use in assessing allowable Klamath Management Zone (KMZ) area harvest. A Rogue River fall chinook ocean abundance index has been developed based on carcass counts, ocean exploitation rates and cohort reconstruction methods. Linear regression analysis is used to relate the Rogue River fall chinook ocean abundance index for age-three, age-four, and age-five fish to inriver carcass counts of age-two, age-three and age-four fish, respectively, of the previous year. The inriver age composition estimates are based on scale sampling of carcasses. Ocean exploitation rates are based on Klamath River fall chinook CWT analysis since 1979 because Rogue River fall chinook ocean exploitation rate information is not available. The ocean harvest distribution and age composition of both Rogue and Klamath fall chinook are similar. The Rogue River fall chinook ocean abundance index for 1998 is 4,100 index fish which is up from the postseason 1997 index of 2,200 chinook, but still well below the long-term average (Table II-7).

Other Stocks

Information is insufficient to forecast the abundance of fall chinook from other smaller rivers south of the Elk River. These stocks are minor contributors to general season mixed stock ocean fisheries.

Evaluation of 1997 Regulations on 1998 Stock Abundance

Given the 1997 regulations and the projected 1998 Oregon coastal chinook stock abundance, it is expected that the aggregate Oregon coastal chinook goal of 150,000 to 200,000 naturally spawning adults will be met.

CHINOOK STOCKS NORTH OF CAPE FALCON

Columbia River Spring Chinook

Predictor Description and Past Performance

Ocean escapement levels predicted for the Columbia River spring chinook runs of the current year will not be affected by 1997 Council fisheries, because most of these fish will have left ocean waters prior to the start of the Council fisheries seasons.

Preseason estimates of the abundance of Columbia River spring chinook stocks are based on age-specific relationships between successive age groups of a brood year class. The database for these estimates includes brood years from the mid-1970s to the mid-1990s. Forecasts of abundance assume that river returns of younger age classes of a brood reflect abundance of the remaining, as yet immature, ocean resident segment of the brood. Annual ocean escapement forecasts are provided to the STT by the staffs of Columbia River management agencies. Separate forecasts are made for upper and lower Columbia River runs, which have distinct management objectives. The STT has not undertaken a review or assessment of abundance estimation methodologies for these stocks.

Lower Columbia River spring chinook stocks, including the Cowlitz, Kalama, and Lewis Rivers stocks, are important contributors to Council area fishery catches north of Cape Falcon. Willamette River spring chinook generally contribute to the more northern Canadian and southeast Alaskan ocean fisheries.

TABLE II-7. Rogue River fall chinook inriver run and ocean population indices. (Page 1 of 1)

Return Year	Inriver Run Index in Thousands of Fish[a/]					Ocean Impact Rate (percentage) by Age[b/]		Ocean Population Index in Thousands of Fish[c/]			
	Age-2	Age-3	Age-4	Age-5	Total[d/]	Age-3	Age-4-5	Age-3	Age-4	Age-5	Total
1977	1.9	0.8	0.3	0.0	3.0	40	60	13.7	1.5	0.1	15.3
1978	1.0	6.1	2.3	0.1	9.5	40	60	72.7	6.0	0.3	78.9
1979	0.2	1.0	6.5	0.0	7.7	36	68	16.6	30.0	0.1	46.7
1980	0.4	0.2	0.9	0.6	2.2	43	75	9.3	7.8	2.5	19.5
1981	1.0	3.1	0.9	0.3	5.2	42	66	13.6	4.0	0.8	18.5
1982	0.7	1.3	1.3	0.1	3.4	57	65	13.3	3.9	0.4	17.5
1983	0.2	0.6	0.9	0.0	1.7	28	70	7.7	3.5	0.1	11.3
1984	0.2	0.8	1.1	0.1	2.2	14	43	10.8	4.0	0.1	14.9
1985	2.5	1.3	3.5	0.6	7.9	25	29	13.6	6.8	0.9	21.3
1986	3.2	12.8	2.4	0.5	18.9	30	52	102.1	7.1	1.1	110.3
1987	2.8	8.5	19.8	0.4	31.5	36	53	88.3	46.9	0.8	136.1
1988	0.9	3.2	16.5	1.0	21.6	37	45	21.7	38.4	1.8	61.9
1989	0.5	1.3	4.0	2.1	7.8	21	44	10.4	8.4	3.7	22.4
1990	0.0	0.3	1.4	0.2	1.9	61	61	11.1	5.5	0.6	17.2
1991	0.2	0.4	1.9	0.5	2.9	10	21	3.8	3.2	0.6	7.7
1992	0.5	0.3	1.5	0.5	2.8	2	4	4.1	2.3	0.5	6.9
1993	0.3	3.5	1.5	0.5	5.7	11	11	17.2	2.9	0.6	20.7
1994	0.5	0.8	5.8	0.9	7.9	5	7	3.2	9.4	0.9	13.6
1995	0.2	0.6	1.4	2.0	4.1	10	21	4.3	1.9	2.5	8.6
1996	0.1	0.4	1.8	0.1	2.3	11	16	2.8[e/]	2.6[e/]	0.1	5.5
1997	0.1	0.3	1.0	0.3	1.7	6	8	0.3[e/]	1.6[e/]	0.3	2.2
1998	-	-	-	-	-	-	-	1.6	2.0	0.5	4.1

a/ Index based on carcass counts in spawning survey index areas. Carcass counts in 1978, 1979 and 1980 adjusted for prespawning mortality. Carcass counts in 1996 adjusted for high river flows during latter part of survey season. Age composition developed from carcass scale sampling.

b/ Exploitation rates since 1979 are based on Klamath River fall chinook cohort analysis.

c/ Based on cohort reconstruction methods. Index values for 1997 predicted from regression equations; postseason estimates are not available.

d/ Excludes age-six fish.

e/ Preliminary; complete cohort not available. Used mean maturity rate to derive estimate.

1998 Stock Status

The 1998 adult upriver spring chinook ocean escapement is projected to be 36,200 fish, less than one-third of the 1997 return of 114,100 adult fish. The 1998 forecast indicates a return to recent year escapement levels (excluding 1997, see Table I-1) and the continued depressed status of this stock.
In recent years, the natural component of this stock generally has comprised less than one-third of the upriver spring chinook run, compared to approximately 70% of the run when the original escapement goal was developed. The 1997 return of 114,100 fish was at least two-thirds of hatchery origin. The natural stock component remains severely depressed, with Snake River spring/summer chinook now listed as threatened under the Endangered Species Act (ESA).

For 1998, the Columbia River Technical Advisory Committee (CRTAC) has projected an ocean escapement of Snake River wild spring chinook of 2,300 adults, based on a new estimation methodology (regression of adults to jacks). The 1997 ocean escapement of Snake River wild spring chinook was 3,300 adult fish.

The 1998 ocean escapement of Willamette River spring chinook is projected to be 32,800 adult fish, close to the 1997 return of 34,300 adults. This is the seventh consecutive year that the Willamette Fish Management Plan goal of 100,000 Willamette River spring chinook returning to the Columbia River is not expected to be achieved and the fifth consecutive year with the Willamette River adult return less than 50,000 fish. On average, the predicted return of Willamette River adult spring chinook was 98% of the actual return for the years 1980-1997.

The 1998 ocean escapement of Cowlitz, Kalama, Lewis spring chinook is predicted to be a record low 2,900 adults.

Columbia River Summer Chinook

Predictor Description and Past Performance

In 1997, the CRTAC reviewed ten different procedures for projecting the adult ocean escapement of upriver summer chinook, including techniques such as linear trend analysis, recent year averages, adult to jack regression analysis, and adult to jack cohort ratios. The CRTAC recommended the use of an adult to jack regression analysis methodology as the best predictor since this model performed the best during the most recent five years when the various procedures were hindcasted. This method has been used each year since 1996.

The 1997 return of 28,000 adult summer chinook was 68% above the preseason expectation, and the largest return since 1990.

The STT has not had the opportunity to undertake a complete review or assessment of the new summer chinook prediction methodology.

1998 Stock Status

Expected ocean escapement of upriver summer chinook in 1998 is 17,300 adult fish, (mid-Columbia River and Snake River components combined), based on the CRTAC recommended predictive methodology (adult to jack regression analysis). The upriver summer chinook stock status remains extremely depressed. The 1998 return is projected to be the fourth lowest on record. A return of 17,300 summer chinook is only 22% of the lower end of the spawning escapement goal range of 80,000 to 90,000 adults measured at Bonneville Dam.

The CRTAC has projected a return of 2,300 Snake River wild adult summer chinook to the mouth of the Columbia River in 1998, compared to a 1997 ocean escapement of 7,000 adult fish. This estimate is based on a new estimation methodology (regression of adults to jacks) for the Snake River summer chinook component. Prior to 1997, the Snake River wild summer chinook component was based on the most recent five-year average Snake River wild proportion of the total upriver run.

Columbia River Fall Chinook

Predictor Description and Past Performance

Columbia River fall chinook stocks typically form the largest contributing stock group to Council chinook fisheries north of Cape Falcon. Abundance of these stocks is a major factor in determining impacts of fisheries on weak natural stocks critical to Council area management. Abundance predictions are made for five distinct fall stock units characterized as being of hatchery or natural production and originating above or below Bonneville Dam: the upriver brights (URB) and lower Columbia River wild (LRW) natural stocks, and the lower Columbia River hatchery (LRH) tule, Spring Creek Hatchery (SCH) tule, and mid-Columbia River brights (MCB) hatchery stocks. The tule stocks generally mature at an earlier age than the natural fall stocks and do not migrate as far north.

Preseason estimates of Columbia River fall chinook stock abundance, used by the STT in assessing the Council's adopted fishery regulations, are based on age-specific and stock-specific forecasts of annual ocean escapement (return to the Columbia River). These forecasts are developed by the technical staffs of the Columbia River management agencies. Columbia River return forecast methodologies used for Council management are generally identical to those used for planning Columbia River fall season fisheries, though minor updates to Council estimates of inriver run size may occur prior to finalization of the inriver fishery plans.

The 1998 return of each fall chinook stock group is estimated using relationships between successive age groups within a brood year. The data base for these relationships was constructed by combining age-specific estimates of escapement and inriver fishery catches for years since 1964, although, only the more recent broods (1975-1994) have been used in most current predictions. Fall chinook stock identification in the Columbia River mixed stock fisheries is determined by sampling catch and escapement for such factors as CWT recovery and visual stock identification (VSI). Age composition estimates are based on CWT data and scale reading of fishery and escapement samples, where available. These stock and age data for Columbia River fall chinook are the basis for tables depicting annual returns presented in the Review of 1997 Ocean Salmon Fisheries (Appendix B, Tables B-15 through B-19). The 1997 returns for the five fall chinook stocks listed in this report will differ somewhat from those provided in the Review of 1997 Ocean Salmon Fisheries since ocean escapement estimates were updated after that report was printed.

Performance of the preliminary river return estimation methodology can be assessed, in part, examining the difference between preseason and postseason estimates for the years 1984-1997 (Table II-8). The March preliminary preseason estimates as a percentage of the postseason estimates for the URB, LRW, LRH, and SCH stock estimates are 89%, 91%, 97%, and 96%, respectively. March preliminary preseason projections for MCB chinook have only been made since 1990, and the March preseason estimate was on average 89% of the postseason estimate from 1990-1997. March estimates of the URB chinook return have been underestimates during seven of the last nine years, and SCH chinook have been overestimates during six of the last nine years

Inaccuracies of ocean escapement estimates developed for the March Council meeting are partly a result of the lack of assessment of variable ocean fishery impacts on these stocks. March estimates of the inriver run size abundance for Columbia River fall chinook stocks are based on age-specific and stock-specific cohort relationships for a database impacted by the historic marine fisheries during the last 20 years. The STT combines the initial inriver run size (ocean escapements) with expected Council area fishery harvest levels and stock distribution patterns to produce adjusted ocean escapement estimates based on the proposed ocean fishing regulations. These revised ocean escapement estimates are available at the end of the Council preseason planning process in April (Table II-8). Preseason projections versus postseason accounting generally indicate that the April estimates provide a more accurate picture of true abundance.

1998 Stock Status

The preliminary forecast for 1998 URB fall chinook ocean escapement is 150,800 adults, 92% of the observed 1997 return of 164,500 adults. No preseason estimate of Snake River wild fall chinook ocean escapement for 1997 is currently available. However, the Columbia River technical staffs are expected to

TABLE II-8. Predicted and postseason returns of Columbia River adult fall chinook in thousands of fish. (Page 1 of 2)

Stock	Year	March Preseason Forecast[a/]	April STT Modeled Forecast[b/]	Postseason Return	March Preseason/ Postseason	April Preseason/Postseason
URB	1984	90.1	93.0	131.4	0.69	0.71
	1985	159.1	159.1	196.4	0.81	0.81
	1986	285.9	286.1	281.5	1.02	1.02
	1987	436.4	436.4	420.7	1.04	1.04
	1988	450.7	446.5	339.9	1.33	1.31
	1989	234.0	231.8	261.1	0.90	0.89
	1990	127.2	126.9	153.4	0.83	0.83
	1991	88.8	88.9	102.7	0.86	0.87
	1992	68.4	66.3	81.0	0.84	0.82
	1993	84.5	82.7	102.9	0.82	0.80
	1994	85.4	94.7	132.9	0.64	0.71
	1995	110.3	125.0	106.5	1.04	1.17
	1996	88.9	94.1	143.2	0.62	0.66
	1997	166.4	158.0	164.5	1.01	0.96
				1984-1997 average:	0.89	0.90
LRW	1984	16.7	NA	13.3	1.26	NA
	1985	12.9	NA	13.3	0.97	NA
	1986	15.7	NA	24.5	0.64	NA
	1987	29.2	NA	37.9	0.77	NA
	1988	43.3	42.1	41.7	1.04	1.01
	1989	27.3	26.9	38.6	0.71	0.70
	1990	23.7	23.4	20.3	1.17	1.15
	1991	12.7	12.7	19.9	0.64	0.64
	1992	17.4	16.7	12.5	1.39	1.34
	1993	12.5	11.9	13.4	0.93	0.89
	1994	14.7	13.2	12.2	1.20	1.08
	1995	12.4	11.5	16.0	0.78	0.72
	1996	8.8	8.1	14.6	0.60	0.55
	1997	7.5	7.2	12.3	0.61	0.59
				1984-1997 average:	0.91	0.87
LRH	1984	70.4	89.0	102.4	0.69	0.87
	1985	81.5	86.7	111.0	0.73	0.78
	1986	171.6	173.9	154.8	1.11	1.12
	1987	294.9	298.7	344.1	0.86	0.87
	1988	267.7	246.5	309.9	0.86	0.80
	1989	104.9	97.5	130.9	0.80	0.74
	1990	68.5	65.5	60.0	1.14	1.09
	1991	71.4	73.1	62.7	1.14	1.17
	1992	113.2	121.5	62.6	1.81	1.94
	1993	79.3	77.7	52.3	1.52	1.49
	1994	36.1	46.5	53.6	0.67	0.87
	1995	35.8	42.4	46.3	0.77	0.92
	1996	37.7	48.3	75.5	0.50	0.64
	1997	54.2	68.7	57.4	0.94	1.20
				1984-1997 average:	0.97	1.03

TABLE II-8. Predicted and postseason returns of Columbia River adult fall chinook in thousands of fish. (Page 2 of 2)

Stock	Year	March Preseason Forecast[a/]	April STT Modeled Forecast[b/]	Postseason Return	March Preseason/ Postseason	April Preseason/Postseason
SCH	1984	21.3	27.0	47.5	0.45	0.57
	1985	34.9	37.1	33.2	1.05	1.12
	1986	16.0	16.2	16.6	0.96	0.98
	1987	9.1	9.2	9.1	1.00	1.01
	1988	6.5	5.9	12.0	0.54	0.49
	1989	29.5	23.0	26.8	1.10	0.86
	1990	27.3	23.7	18.9	1.44	1.25
	1991	56.3	61.4	52.4	1.07	1.17
	1992	40.9	41.3	29.5	1.39	1.40
	1993	19.9	18.2	16.8	1.18	1.08
	1994	20.2	28.9	18.5	1.09	1.56
	1995	17.5	22.5	33.8	0.52	0.67
	1996	27.6	35.2	33.1	0.83	1.06
	1997	21.9	25.7	26.0	0.84	0.99
				1984-1997 average:	0.96	1.02
MCB	1990	69.5	69.3	59.1	1.18	1.17
	1991	48.4	48.5	35.9	1.35	1.35
	1992	42.5	40.7	31.1	1.37	1.31
	1993	33.0	32.3	27.4	1.20	1.18
	1994	23.9	26.7	33.7	0.71	0.79
	1995	26.5	30.1	34.1	0.78	0.88
	1996	40.8	43.2	59.7	0.68	0.72
	1997	72.1	61.9	60.0	1.20	1.03
				1990-1997 average:	0.89	0.90

a/ March preseason forecasts are ocean escapements based on terminal run size and stock-specific cohort relationships affected by the historical "normal" ocean fisheries during the brood year data base time period (generally 1978-1994).

b/ STT modeled forecasts adjust March preseason forecasts for Council-adopted ocean regulations each year and should provide a more acurate estimate of expected ocean escapement.

develop a run size estimate for this critical ESA listed stock during the March or April Council meeting process.

Ocean escapement of LRW fall chinook in 1998 is forecast at 8,100 adults, 66% of the 1997 observed return of 12,300 adults. The forecast is similar to the forecasts of 8,100 and 7,200 ocean escapement made in 1996 and 1997 respectively.

The preliminary forecast for 1998 ocean escapement of LRH fall chinook is for a return of 19,200 adults. Recent reductions in LRH production, especially in Oregon as a result of Mitchell Act funding cuts, have decreased the ocean escapement needed to meet hatchery brood stock requirements. However, the March forecast return is still only 60% of the current estimated ocean escapement of 32,000 adults needed to meet broodstock requirements.

Ocean escapement of SCH fall chinook in 1998 is projected to be 14,200 adults, only approximately 54% of the 1997 actual return of 26,000 adults.

The preliminary forecast for the 1998 ocean escapement of MCB fall chinook is 47,800 adults, 80% of the 1997 observed return of 60,000 adults. MCB chinook are returns primarily from hatchery releases of bright fall chinook stock in the area below McNary Dam, although some natural spawning in tributaries in the area between Bonneville and McNary dams also occurs.

Washington Coastal Chinook

Predictor Description and Past Performance

Preseason abundance estimates for many Washington coastal chinook stocks are not available for consideration in Council preseason fishery management planning. Since Council fisheries have only a minor impact on the ocean escapement of Washington coastal stocks, they also have not been included in the preseason fishery impact assessment reports prepared by the STT.

1998 Stock Status

Preseason forecasts for most Washington coastal chinook stocks are not available at this time. Willapa Bay hatchery fall chinook are forecast at 15,500 adults, 76% below the 1997 preseason projection of 64,500. Willapa Bay natural fall chinook are forecast at 4,200 adults.

Puget Sound Chinook

Expectations for Puget Sound run size of the various stock management units of this region are listed in Table I-1. A comparison of preseason and postseason forecasts for recent years is detailed in Table II-9. The STT has not undertaken a review of the methods employed by state and tribal staffs in preparing these abundance forecasts. Methodologies for estimates are described in the annual Puget Sound management reports (starting in 1993, reports are available by Puget Sound management unit, not by individual species). Forecasts for Puget Sound stocks generally assume production is dominated by age-four adults.

1998 Stock Status

Spring Chinook

Spring chinook originating in Puget Sound are expected to remain depressed. Runs in the Nooksack, Skagit, White, and Dungeness Rivers are of continuing concern.

Summer/Fall Chinook

Preliminary information for Puget Sound summer/fall stocks indicates that the total 1998 return is expected to be similar to the 1997 preseason forecast. Changes in the abundance of individual stocks from various production areas are detailed in Table I-1.

TABLE II-9. Comparison of preseason and postseason forecasts of Puget Sound run size for summer/fall chinook.[a/] (Page 1 of 1)

Region	1997[b/] Pre-season	1996 Pre-season	1996 Post-season[c/]	1996 Pre/Post Ratio	1995 Pre-season	1995 Post-season	1995 Pre/Post Ratio	1994 Pre-season	1994 Post-season	1994 Pre/Post Ratio	1993 Pre-season	1993 Post-season	1993 Pre/Post Ratio
					THOUSANDS OF CHINOOK								
Nooksack/Samish (Hatchery and Natural)	34.0	27.0	29.4	0.92	38.5	22.2	1.70	46.6	28.1	1.66	50.4	32.9	1.53
East Sound Bay (Hatchery)	1.2	1.7	0.7	2.43	3.5	0.2	17.5	3.2	0.8	4.00	3.2	3.8	0.84
Skagit (Hatchery)	0.1	1.0	1.2	0.83	1.6	3.3	0.48	1.3	4.3	0.30	1.0	1.4	0.71
Skagit (Natural)	6.4	7.1	12.2	0.58	5.0	9.6	0.52	8.4	6.6	1.27	14.0	7.0	2.00
Stillaguamish (Natural)	1.6	1.3	2.3	0.57	1.8	1.4	1.29	1.4	1.3	1.08	2.0	1.3	1.54
Snohomish (Hatchery)	7.7	6.7	9.2	0.73	2.2	6.0	0.37	1.8	5.4	0.33	1.6	2.7	0.59
Snohomish (Natural)	5.2	4.2	8.0	0.53	4.3	5.9	0.73	4.5	5.0	0.90	4.9	5.7	0.86
Tulalip (Hatchery)	4.0	2.7	4.0	0.68	2.3	4.1	0.56	2.8	1.9	1.47	2.8	1.4	2.00
South Puget Sound (Hatchery)	65.1	51.9	57.6	0.90	49.6	74.5	0.67	52.7	46.2	1.14	61.8	36.8	1.68
South Puget Sound (Natural)	18.2	19.0	35.8	0.53	21.7	34.5	0.63	18.0	29.9	0.60	26.5	19.8	1.34
Hood Canal (Hatchery and Natural)	2.7	9.0	8.2	1.10	3.9	9.4	0.41	11.5	3.8	3.03	11.7	4.8	2.44
Strait of Juan de Fuca (Hatchery)	2.2	2.8	0.2	14.00	3.0	0.1	30.00	3.9	1.6	2.44	0.7	0.2	3.50
Strait of Juan de Fuca (Natural)	0.8	0.9	3.1	0.29	0.9	2.7	0.33	1.0	0.5	2.00	3.1	2.4	1.29

a/ Puget Sound run size is defined as the run available to Puget Sound net fisheries. Does not include fish caught by troll and recreational fisheries.
b/ Postseason estimates not available at time of printing.
c/ Preliminary.

Hatchery Production - The total return from Puget Sound hatchery production is expected to be three percent below the 1997 predicted level. Expected returns from north Puget Sound facilities are expected to be 20% less than 1997 returns, while returns from south Puget Sound facilities are expected to be four percent greater than in 1997.

Natural Production - The total return of natural Puget Sound summer/fall stocks is expected to be nine percent above the 1997 predicted level. Returns to the Skagit River are forecast to be slightly above the 1997 level and are still not expected to reach the escapement goal. Returns to the Stillaguamish River system are forecast to be the same as the 1997 level, and returns to the Snohomish River are forecast to be 15% below the 1997 level. Returns to the Strait of Juan de Fuca are forecast to be 12% greater than the 1997 level, and returns to south Puget Sound are forecast to be 19% above the 1997 level. Natural stocks from Puget Sound have experienced poor survival in recent years, resulting in depressed production and escapements. Only three natural Puget Sound summer/fall chinook stocks have met escapement goals at least once in the last five years (Hoko, Green, and Nisqually).

Evaluation of 1997 Regulations on 1998 Stock Abundance North of Cape Falcon

A detailed assessment of 1998 projected ocean fishery impacts with 1997 regulations for north of Cape Falcon chinook stocks has not been completed. The chinook model used for impact assessment in 1997 is currently being modified to include recent data on ocean fishery impacts and abundance forecasts. The updating procedure for the chinook model used for impact assessment incorporates adjustments due to variable impacts by ocean fisheries. It will not be ready for use in 1998 until the March Council meeting.

Council fisheries north of Cape Falcon have a very minor impact on most stocks that originate in Washington coastal and Puget Sound Rivers since they have northerly marine distribution patterns. The stocks that are major contributors to Council fisheries north of Cape Falcon include Columbia River fall hatchery tules, which normally account for more than half the total catch, Puget Sound summer/fall, lower Columbia River spring, and California and Oregon coastal chinook stocks.

The expected low abundance of Columbia River hatchery tule stocks in 1998, projected at 33,400 tules, compares to the 1997 return of 83,400 adults and is the lowest projected tule return since at least 1983 (Table II-8). In contrast, the 1986-1989 (recent period of high returns) average Columbia River tule stock return was 251,100 adult fish and the 1976-1997 long-term average return was 175,700 adult fish. Reduced abundance of this stock, which normally constitutes a major portion of the chinook catch in the Council area north of Cape Falcon, increases the importance of considering the status of other stocks when evaluating impacts of ocean fishery regulations.

Abundance levels for Columbia River stocks presented in the stock status section of this report (Table I-1) are ocean escapement levels which assume recent-year average ocean fishery impacts. Allowable harvest levels for Council treaty Indian and non-Indian fisheries in this area for 1997 were well below average levels allowed in the 1980s and early 1990s.

CHAPTER III
COHO SALMON ASSESSMENTS

COLUMBIA RIVER AND OREGON COASTAL COHO (OREGON PRODUCTION INDEX AREA)

The majority of the coho harvested in the Oregon production index (OPI) area originate from stocks produced in rivers located within the OPI area (Leadbetter Point, Washington, to the U.S.-Mexico border). These stocks include hatchery and natural production from the Columbia River, Oregon coast, and northern California.

The Council adopted revised abundance estimation predictors in 1987, for use starting in 1988, which were expected to more accurately predict the abundance of individual stock components originating in the OPI area. These stock components are: (1) public hatchery (OPIH), (2) Oregon coastal natural river (OCNR), (3) Oregon coastal natural lake (OCNL), (4) private hatchery (PRIH), and (5) hatchery smolt production from the Oregon coastal Salmon Trout Enhancement Program (STEP).

Based on new studies that indicate Oregon coastal natural (OCN) spawner escapements have been overestimated, annual OPI abundance index projections are adjusted. A stratified random sampling (SRS) study, implemented in 1990, indicated an overestimation of annual OCN spawner escapement. Because OPI area ocean impacts are proportioned to the various OPI stocks based on ocean escapements, a reduction in OCN spawner escapement indicates that traditional OCN abundances are overestimated, while traditional abundance estimates for other OPI area stocks are underestimated. Starting in 1992, the Council adopted an additional abundance adjustment procedure for use in assessing fishery impacts. This procedural change, based on improved estimates of OCN spawner escapements, adjusted traditional index abundances of the various OPI area stocks. In attempting to achieve targeted exploitation rates and spawner escapement goals, the various OPI area stock abundance index predictions have been scaled in the Fishery Regulation Assessment Model (FRAM) to reflect the results of the ongoing OCN spawner study and are referred to as SRS abundances.

For 1998, two OPI area stock abundances are projected in SRS accounting (OCNR and OCNL) while two others are forecasted in index accounting (OPIH and STEP) and then adjusted to SRS accounting. To facilitate direct comparisons of 1998 abundance forecasts with recent year abundance projections, both preseason and postseason, only forecasts in SRS accounting will be reported in Table III-1. Recent year comparisons of OPI area stock-specific abundance projections based on index accounting are reported in Appendix B, Table B-1.

Public Hatchery Coho

OPI area public hatchery coho smolt production occurs primarily in Columbia River facilities and net pens. Several facilities located in Oregon coastal rivers and in the Klamath River, California, collectively produce lesser amounts of coho as well. OPI area smolt releases are reported by geographic area since 1960 in Appendix B, Table B-2.

Predictor Description

Since 1988, the adult abundance of the OPIH index stock has been predicted using a linear multiple regression that relates OPI hatchery adults to the Columbia River, coastal Oregon, and Klamath River jack returns from the same cohort (previous year jack counts), and the proportion of Columbia River smolts from the same cohort with delayed release rearing strategy. All jack counts were adjusted for misidentified small adults (mostly Columbia River returns).

Specifically, the OPIH stock predictor uses the dependent variables of Columbia River jacks adjusted for small adults (Jack CR), Oregon coastal and Klamath River Basin jacks adjusted for small adults (Jack OC),

TABLE III-1. Preliminary 1992-1997 preseason and postseason coho stock SRS abundance estimates for OPI area stocks in thousands of fish.[a/]

Stock	Year	Preseason	Postseason	Preseason/Postseason
OPIH	1992	479.2	540.3	0.89
	1993	589.4	261.7	2.25
	1994	147.5	203.9	0.72
	1995	301.5	145.6	2.07
	1996	309.2	182.6	1.69
	1997	376.1	215.3	1.75
OCN	1992	77.1	90.1	0.86
	1993	82.2	98.9	0.83
	1994	49.3	45.2	1.09
	1995	60.0	68.5	0.88
	1996	63.2	86.1	0.73
	1997	86.4	27.8	3.11
STEP	1992	2.1	1.2	1.75
	1993	5.5	3.5	1.57
	1994	0.8	1.8	0.44
	1995	8.3	0.5	16.60
	1996	0.4	1.2	0.33
	1997	1.3	0.3	4.30

a/ Forecasts represent SRS accounting to assess fishery impacts. See text for explanation.

and a correction term for delayed smolts released from Columbia River hatcheries (Jack CR * [SmD/SmCR]) to predict public hatchery stock abundance.
For the 1998 abundance prediction, the data base includes 1970-1997 recruits, excluding the El Niño adult impact year of 1983. It also includes 1969-1997 jack returns, excluding 1982, also due to El Niño influence. The model, with coefficients, is:

OPIH(t) = a + b*Jack CR(t-1)+c*Jack OC(t-1)+d*Jack CR(t-1)*[SmD(t-1)/SmCR(t-1)]
Where: a = -110.075889
b = 16.107707
c = 14.118378
d = 37.042726
adjusted r^2 = 0.95

The OPIH stock data set, and a definition of the above terms, are presented in Appendix B, Table B-3.

Predictor Performance

Recent year OPIH stock preseason abundance predictions, adjusted to SRS accounting, are compared with postseason estimates in Table III-1. The 1997 preseason abundance prediction of 376,100 OPIH coho was 75% above the preliminary postseason estimate of 215,300 coho.

Since 1983 the OPIH predictor has performed poorly, due principally to high interannual variability in the jack to adult ratios.

1998 Stock Status

Using the appropriate values from Table B-3, the OPIH index abundance prediction for 1998 is 71,800 coho, which equates to 118,400 coho in SRS accounting. The 1998 SRS forecast is 69% below the 1997 preseason prediction of coho and 55% below the 1997 postseason estimate (Table III-1).

Oregon Coastal Natural Coho

The OCN stock is composed of natural production from OCNR and OCNL systems, which are predicted independently.

Predictor Description

Oregon Coastal Natural Rivers

From 1988-1993, the abundance of OCNR index coho was predicted using a modified Ricker spawner-recruit model. The predictor related OCNR recruits to the parent brood stock size incorporating an adjustment for ocean survival based on OPI hatchery smolt to jack survival the previous year. Due to a tendency to overpredict abundances, the data base in the predictor was shortened from 1970-1991 to 1980-1991 starting with 1992 predictions.

Because of concern that the adopted OCNR model does not adequately incorporate environmental variability, an alternative model was used for predicting 1994 and 1995 index abundances. The model related ocean upwelling, sea surface temperatures, and year to predict OCNR index coho abundance.

For 1996-1997, and also recommended for 1998, the environmental based model, without the year component, was used in predicting OCNR stock abundances. In addition, the predictions are in SRS rather than traditional index accounting. Specifically, the OCNR environment-based predictor uses annual deviation from the mean April-June Bakun upwelling index at 42° N latitude (UpAnom), and annual deviation from the mean January sea surface temperature at Charleston, Oregon (JanAnom), to predict OCNR abundance.

For the 1998 OCNR abundance prediction, the data base includes 1990-1997 recruits, 1990-1997 upwelling, and 1991-1998 sea surface temperatures. The model, with coefficients, is:

ln(Recruits)		=	a+b*UpAnom+c*JanAnom
Where:	a	=	4.101451
	b	=	0.003203
	c	=	-0.231188
adjusted r^2		=	0.21

The OCNR stock data set, and a definition of the above terms, are presented in Appendix B, Table B-4.

Oregon Coastal Natural Lakes

Since 1988, the abundance of OCNL index coho has been predicted using the most recent three-year average adult stock abundance. OCNL coho production occurs from three lake systems (Ten Mile, Siltcoos, and Tahkenitch lake systems). Production from these systems has declined substantially from the levels observed during 1950-1980. For 1996-1997, and also recommended for 1998, the prediction is in SRS rather than traditional index accounting.

Predictor Performance

Recent-year OCN stock preseason SRS abundance predictions are compared to postseason estimates in Table III-1. The 1997 preseason abundance prediction of 86,400 OCN coho was 311% of the preliminary postseason estimate of 27,800 coho.

1998 Stock Status

The 1998 preseason prediction for OCN (river and lake systems combined), in SRS accounting, is 47,200 coho, 45% below the 1997 preseason prediction of 86,400 coho and 170% of the 1997 postseason estimate (Table III-1). The 1998 preseason SRS prediction for OCNR and OCNL components are 34,400 and 12,800 coho, respectively.

Private Hatchery Coho

There have not been any Oregon coastal PRIH coho smolt releases since 1990. Thus, there was no recruitment for 1992-1998 of the PRIH coho stock.

Salmon Trout Enhancement Hatchery Coho Smolt Program

Predictor Description

Since 1988, preseason abundance predictions for Oregon coastal STEP index coho smolt production facilities have been based on the Council-approved procedure. This procedure evaluates: (1) smolt releases by facility, (2) smolt to adult survival based on the previous year's survival by facility, and (3) survival adjustments based on changes in OPI smolt to jack survival the previous year.

Predictor Performance

Recent-year STEP preseason abundance predictions, adjusted to SRS accounting, are compared to postseason estimates in Table III-1. The 1997 preseason SRS abundance prediction of 1,300 coho was 433% of the preliminary postseason estimate of 300 coho.

1998 Stock Status

The 1998 preseason STEP index abundance prediction is 200 coho, which equates to 200 coho in SRS accounting. The 1998 SRS prediction is a six-fold decrease over the 1997 preseason prediction of 1,300 coho and slightly less than the 1997 postseason estimate (Table III-1).

Oregon Production Index Area Summary of 1998 Stock Status

The 1998 combined OPI area stock abundance, in SRS accounting, is predicted to be 136,500 coho, which is 29% of the 1997 preseason prediction of 463,800 coho and 56% of the 1997 postseason estimate of 243,400 coho. The 1998 OPI area predictions can be compared to historical abundances in Table III-2 and Figure III-1.

WASHINGTON COASTAL AND PUGET SOUND COHO STOCKS

Predictor Description and Past Performance

A variety of preseason abundance estimators currently are employed for Washington coastal and Puget Sound coho stocks (Table I-2).

In previous years, initial estimates of abundance for some Puget Sound and Washington coastal stocks, prepared by state and tribal staffs for use by the Salmon Technical Team (STT) in Council preseason planning, represented terminal run sizes assuming an average ocean or preterminal area fishery impact rate. Forecasts of ocean escapement for each stock were adjusted according to the approximate level of harvest expected in Council and other fisheries (e.g., West Coast Vancouver Island [WCVI] troll) and average stock distribution patterns by time and area. These adjustments are made with the use of the FRAM, a stock-fishery impact assessment model which has been employed by the STT and other management entities in planning since 1980. This year is the first year the run predictions were provided in terms of ocean recruits. This eliminated the need to expand the runs from a terminal run to an estimate of ocean abundance.

For the 1997 season, allowable ocean fishery impacts in the area north of Cape Falcon were determined by the depressed status of several Puget Sound and Washington coastal natural coho stocks. A comparison of expected preseason and postseason abundance estimates for these stocks in recent years is presented in Table III-3. Postseason estimates of 1997 stock abundances for some of these stocks are not available at this time.

The comparison of preseason and postseason estimates of returns to terminal areas reflects annual errors in abundance estimates, deviations in ocean fisheries from preseason expectations, and variations in ocean distributions of stocks as described in the introduction. Fishery impact levels anticipated preseason may be quite different than those which actually occur. Postseason reconstructions of total fishery impacts and abundance estimates have not been completed for the 1997 season.

1998 Stock Status

Willapa Bay

The 1998 Willapa Bay hatchery total ocean coho stock abundance forecast is 20,800 adults, approximately 71% less than 1997. The prediction is based upon an average terminal area return per release (1992-1997) adjusted by a mean jack return rate for the same brood years. Willapa Bay coho production is predominantly of hatchery origin and until 1998 only hatchery abundance was predicted. This year, an estimate of natural coho of 3,300 is available.

TABLE III-2. Oregon production index (OPI) coho harvest , spawning and abundance estimates by index and SRS accounting in thousands of fish.[a/] (page 1 of 1)

	Ocean Fisheries[b/]		Oregon and California Coastal Returns							
			Hatcheries and Freshwater	OCN Spawners[d/]				Abundance		Ocean Exploitation Rate
Year	Troll	Sport	Harvest[c/]	Index	SRS	Private Hatcheries	Columbia River Returns	Index	SRS	Index (%)[e/]
1970	1,463.7	499.0	80.3	249.2	-	-	895.3	3,187.5	-	62
1971	2,543.5	715.8	53.8	322.4	-	-	544.5	4,180.0	-	78
1972	1,275.6	560.3	29.9	126.9	-	-	277.8	2,270.5	-	81
1973	1,320.3	443.2	42.2	161.1	-	-	291.3	2,258.1	-	78
1974	2,095.1	668.6	49.5	132.8	-	-	460.8	3,406.8	-	81
1975	1,079.2	463.7	19.2	158.6	-	-	292.5	2,013.2	-	77
1976	2,936.1	977.7	62.6	158.3	-	-	337.0	4,471.7	-	88
1977	664.4	412.1	21.4	66.8	-	4.2	93.8	1,262.8	-	85
1978	1,104.2	524.6	12.6	73.8	-	12.3	307.1	2,034.6	-	80
1979	1,056.6	334.4	27.4	173.6	-	49.2	275.1	1,916.3	-	74
1980	506.9	526.4	32.1	108.9	-	38.7	301.6	1,514.6	-	69
1981	830.9	339.9	34.1	73.0	-	117.8	170.3	1,566.0	-	79
1982	740.9	300.4	37.1	132.6	-	184.7	453.1	1,848.8	-	59
1983	429.6	275.0	18.2	58.8	-	133.9	100.5	1,016.0	-	75
1984	95.8	174.2	51.2	208.7	-	115.4	414.2	1,059.5	-	27
1985	166.4	280.4	45.4	190.9	-	332.0	366.2	1,381.3	-	38
1986	643.5	320.6	81.8	190.8	-	453.7	1,527.8	3,218.2	-	32
1987	469.1	296.2	45.3	82.5	-	119.3	307.6	1,320.0	-	57
1988	844.7	297.2	62.4	160.8	-	116.1	664.8	2,146.0	-	53
1989	646.9	425.5	62.3	144.5	-	46.9	701.6	2,027.7	-	52
1990	277.6	357.1	30.6	104.0	20.9	35.6	196.1	1,001.0	917.9	62
1991	450.6	469.9	84.0	135.5	36.4	35.1	934.3	2,109.3	2,010.2	43
1992	67.5	256.5	52.6	138.6	39.3	-	210.9	726.1	627.2	44
1993	13.2	140.8	41.5	168.0	54.5	-	113.9	477.4	363.8	32
1994	2.7	3.0	31.8	130.5	43.7	-	168.9	337.9	251.1	2
1995	5.4	43.5	39.3	131.3	52.4	-	74.0	293.4	214.6	17
1996	7.0	31.8	49.3	212.1	73.0	-	111.3	411.5	272.4	9
1997[f/]	5.5	22.4	26.3	68.6	24.1	-	146.6	269.4	229.4	10

a/ The OPI includes ocean and inside harvest impacts and escapement to streams and lakes south of Leadbetter Point, Washington.

b/ Includes estimated nonretention mortality: troll fishery-hook-and-release mortality for 1982-1997 and drop-off mortality for all years; sport fishery-hook-and-release mortality for 1994-1997 and drop-off mortality for all years.

c/ Includes returns form STEP smolt releases.

d/ Spawners returning to rivers have historically been estimated by a nonrandom standard index. Beginning in 1990, returns have also been estimated with a stratified random sampling (SRS) method. The SRS method indicates that actual total natural spawners are less than those projected by the standard index. Beginning in 1998, the Council will no longer use the index numbers for management of OCN coho (Amendment 13 to the salmon plan).

e/ Ocean fishery impacts on private hatchery stock and returns to private hatcheries are excluded in calculating the OPI area stock aggregate ocean exploitation rate index. Because of uncertainties in estimates of OCN coho spawners, the Oregon production exploitation rate index does not represent a true exploitation rate on OPI coho.

f/ Preliminary.

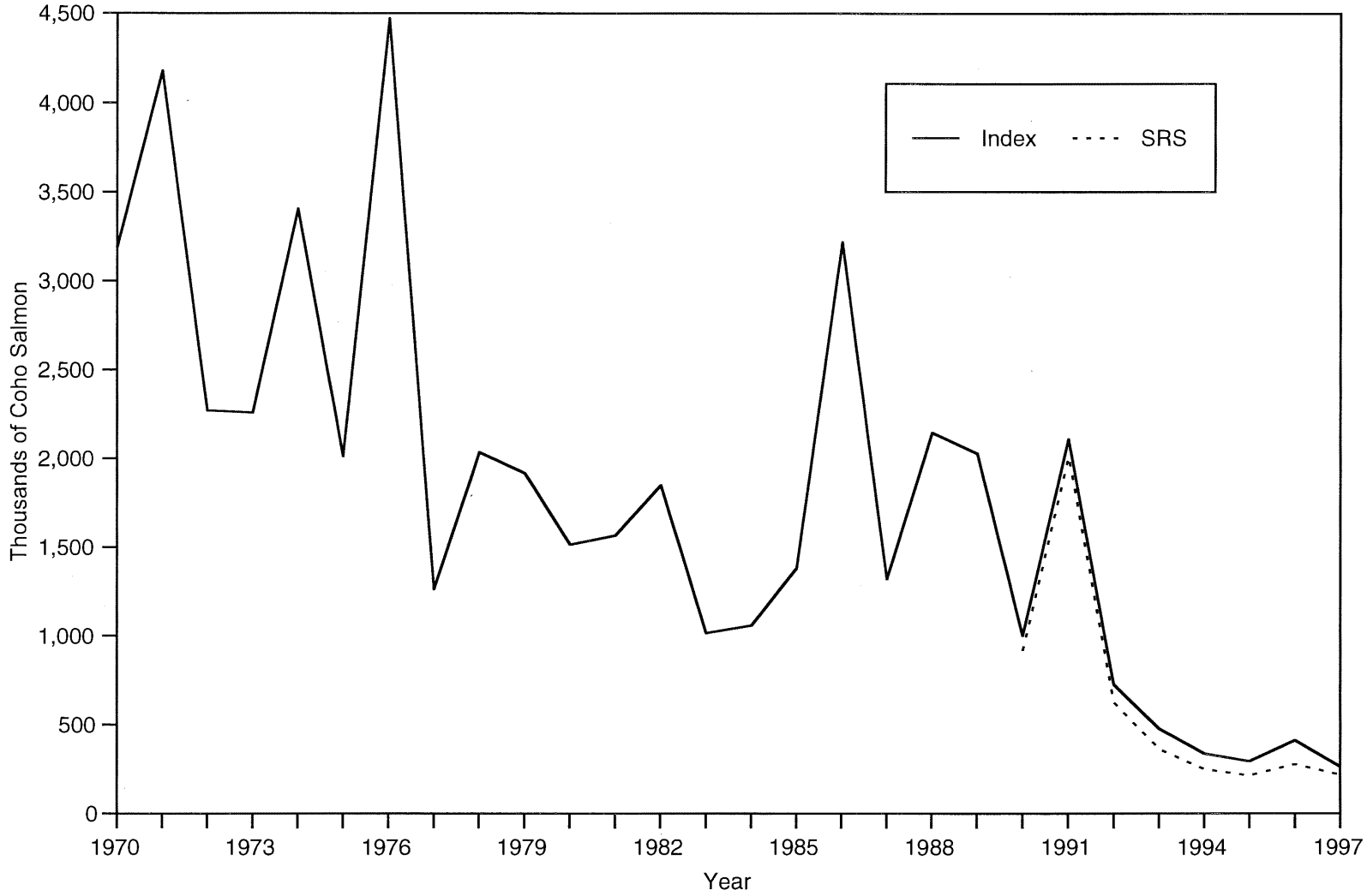

FIGURE III-1. Oregon production area coho salmon abundance estimates by index and SRS accounting methods, 1970-1997.

TABLE III-3. Preseason and postseason ocean escapements for selected Puget Sound and Washington coastal adult natural coho stocks in thousands of fish. The 1997 postseason estimates are preliminary. (Page 1 of 2)

Stock	Year	Preseason Forecast	Postseason Return	Preseason/ Postseason
Skagit River	1984	29.6	37.2	0.80
	1985	26.1	31.3	0.83
	1986	43.5	73.4	0.59
	1987	33.0	41.2	0.80
	1988	29.6	29.9	0.99
	1989	31.2	27.6	1.13
	1990	37.6	26.3	1.43
	1991	40.8	11.8	3.46
	1992	35.7	9.5	3.76
	1993	28.1	14.5	1.94
	1994	17.9	30.5	0.59
	1995	30.0	16.2	1.85
	1996	26.7	8.7	3.07
	1997	34.2	NA	NA
Stillaguamish River	1984	NA	26.9	NA
	1985	NA	34.4	NA
	1986	37.0	49.9	0.74
	1987	29.7	46.3	0.64
	1988	24.5	35.4	0.69
	1989	24.5	13.5	1.81
	1990	30.8	34.1	0.90
	1991	32.9	11.3	2.91
	1992	18.7	18.0	1.04
	1993	24.5	10.6	2.31
	1994	10.2	30.3	0.34
	1995	32.7	20.4	1.60
	1996	29.8	10.1	2.95
	1997	15.7	NA	NA
Hood Canal	1984	NA	57.5	NA
	1985	NA	38.5	NA
	1986	NA	82.2	NA
	1987	NA	71.7	NA
	1988	18.2	15.5	1.17
	1989	36.8	25.5	1.44
	1990	43.9	14.2	3.09
	1991	17.6	15.3	1.15
	1992	10.1	19.9	0.51
	1993	39.5	16.7	2.37
	1994	13.5	57.1	0.24
	1995	19.3	41.1	0.47
	1996	15.4	37.3	0.41
	1997	38.1	NA	NA
Quillayute River Fall	1984	7.0	10.9	0.64
	1985	19.2	15.7	1.22
	1986	6.1	17.0	0.36
	1987	11.7	23.8	0.49
	1988	10.4	9.1	1.14
	1989	14.5	11.2	1.29
	1990	15.2	9.5	1.60
	1991	8.8	10.9	0.81
	1992	12.5	13.5	0.93
	1993	7.6	4.7	1.62
	1994	7.0	6.4	1.09
	1995	8.5	14.2	0.60
	1996	9.2	18.7	0.49
	1997	5.1	4.9	1.04

TABLE III-3. Preseason and postseason ocean escapements for selected Puget Sound and Washington coastal adult natural coho stocks in thousands of fish. The 1997 postseason estimates are preliminary. (Page 2 of 2)

Stock	Year	Preseason Forecast	Postseason Return	Preseason/ Postseason
Hoh River Fall	1984	2.7	7.7	0.35
	1985	6.6	5.2	1.27
	1986	3.9	6.4	0.61
	1987	5.5	7.2	0.76
	1988	2.0	2.6	0.77
	1989	5.7	5.4	1.06
	1990	5.1	4.5	1.13
	1991	3.4	5.4	0.63
	1992	4.9	5.0	0.98
	1993	4.8	1.9	2.53
	1994	3.0	1.4	2.14
	1995	4.4	5.4	0.81
	1996	3.0	5.8	0.52
	1997	1.6	1.6	1.00
Queets River	1984	5.2	9.7	0.54
	1985	11.3	6.0	1.88
	1986	5.2	5.8	0.90
	1987	9.0	8.9	1.01
	1988	4.7	4.5	1.04
	1989	6.2	5.5	1.13
	1990	5.9	6.9	0.86
	1991	7.9	8.6	0.92
	1992	5.6	7.0	0.80
	1993	6.5	5.4	1.20
	1994	3.6	1.2	3.00
	1995	7.2	7.3	0.99
	1996	5.4	8.3	0.65
	1997	2.4	3.9	0.62
Grays Harbor[a/]	1984	28.7	103.8	0.28
	1985	56.4	25.1	2.25
	1986	51.6	33.3	1.55
	1987	103.3	55.7	1.85
	1988	26.4	56.7	0.47
	1989	43.0	60.9	0.71
	1990	48.3	67.5	0.72
	1991	138.0	118.4	1.17
	1992	48.4	44.7	1.08
	1993	84.7	40.2	2.11
	1994	31.3	15.5	2.02
	1995	64.4	69.5	0.93
	1996	82.7	101.0	0.82
	1997	14.8	NA	NA

a/ The source of the postseason return estimates is Washington Department of Fish and Wildlife.

Grays Harbor

Preseason predictions of abundance are made for natural fish throughout the system and for hatchery fish returning to three freshwater rearing complexes and two saltwater net pen sites. The estimate of Grays Harbor natural stock ocean abundance for 1998 is 30,100 adults, an increase of 15% from the 1997 preseason expected abundance. The estimate of hatchery stock ocean abundance is 25,600 adults, a decrease of 75% from the 1998 preseason estimate.

The hatchery forecast was derived by applying smolt releases times expected marine survivals based in jack return rates. The staffs of the Washington Department of Fish and Wildlife (WDFW) and the Quinault Indian Nation (QIN) have reached agreement of 1998 forecasts for wild coho returning to Grays Harbor. The agreed forecast for 28,309 represents the mean of terminal returns per spawner derived from databases from different time periods. WDFW's forecast (24,482) utilizes the 92-96 return years while QIN's forecast (32,136) utilizes the 85-96 return years (94 excluded). Both forecasts are adjusted using jack survival indices.

Ocean abundance was estimated from the terminal fun forecast, based on estimates of smolt production and survival to ocean recruits provided by WDFW.

Quinault River

The forecast for the Quinault natural coho ocean run size is 6,500 fish, an increase of 225% from the 1997 projected level. This estimate represents the 1995 brood year escapement (4,969) multiplied by the 1989-1993 average ocean recruits per spawner, adjusted by a factor reflecting anticipated reduced survival (0.554), reflecting expectations for reduced survival of Queets coho.

The Quinault hatchery coho ocean run size is forecast at 3,900 fish, a decrease of 24% compared to the 1997 level. The forecast is derived from the mean of the lowest two observed marine survival rates (0.0063) over the 1987-1993 brood years and 1995 brood year smolt releases (625,000).

Queets River

The Queets natural coho ocean run size is forecast at 4,200 fish, a decrease of two percent compared to 1997. This forecast represents the estimated smolt production from natural spawning (339,800) multiplied by the lowest observed ocean survival rate (0.0107 for tagged fish, 0.0127 for untagged fish) during the 1984-1993 brood years.

Forecast ocean abundance of supplemental production from smolt releases is 700 fish, a 30% decrease from 1997. This forecast is based on releases (177,600) multiplied by the lowest observed marine survival rate observed since 1985 (0.0039).

The Queets hatchery coho ocean run size forecast is 4,600 fish, a decrease of 71% compared to the 1997 forecast level. This forecast is based on the smolt release of 571,900 multiplied by the lowest observed marine survival rate since 1983 (0.0081).

Hoh River

The Hoh River natural coho ocean run size is forecast at 3,400 fish, an increase of 21% compared to the 1997 forecast. This forecast is based on estimated smolt production per spawner (average of Queets and Clearwater) and an ocean survival rate of 0.0172. The ocean survival rate is estimated as the forecast for wild coho from Bingham Creek in Grays Harbor (0.0123) multiplied by a factor (1.6857) reflecting the average relationship between survival of Queets and Bingham smolt survival.

No hatchery production is projected for the Hoh system for 1998.

Quillayute River

The Quillayute River summer natural and hatchery coho ocean run sizes are forecast at 1,300 and 1,800 fish, respectively. The natural component run size is based on regressions between ocean recruits and brood year escapements. The hatchery component run forecast is based on average ocean recruits per release multiplied by the number of smolts released. The 1998 forecast abundance of natural and hatchery components represent decreases of 19% and 50%, respectively, when compared to 1997 forecast levels.

The Quillayute River fall natural and hatchery coho ocean run sizes are forecast at 8,000 and 4,400 fish, respectively. The forecast of the natural component run size is based on the average recruits per spawner (2.652), multiplied by the 1995 spawning escapement (10,035). The hatchery production forecast is based on average ocean recruits per release multiplied by the number of smolts released. The 1998 forecast abundance of natural and hatchery components are ten percent and 52%, respectively, below the 1997 forecast levels.

The forecasts for Quillayute coho stocks derived using the procedures described above were reduced by 70% in anticipation of reduced ocean survivals reflected by poor 1997 jack return rates.

Puget Sound

The expectation for total abundance of natural and hatchery Puget Sound coho stocks combined is 33% below the 1997 preseason forecast level. Abundance of natural stocks is expected to be 17% below 1997 forecast levels, while the abundance of hatchery stocks is expected to be 41% below the 1997 preseason forecast.

A variety of methods were used for the 1998 Puget Sound coho forecast. For all hatchery predictions (except Strait of Juan de Fuca and Hood Canal) a new cohort (landed catch plus escapement) database for return years 1986-1991 was used to estimate historic survival rates. The average survival for these years times the smolts released yielded the predicted December age-two cohort size. Because these years did not reflect the poor survivals observed in more recent years, an adjustment to the predictions were made, lowering the estimates. Generally, the adjustment factor was created by taking known marine survivals for three wild stock groups, averaging the survivals for return years 1993-1997 and dividing by the average of return years 1986-1991. This factor was applied to each hatchery forecast except Hood Canal and the Strait of Juan de Fuca. The Hood Canal and Strait of Juan de Fuca hatchery forecasts were derived from the average December age-two recruit survival (return years 1988-1996) times the smolts released.

Generally, the wild forecasts were the estimated number of wild smolts multiplied by the 1991-1996 average marine survivals. The forecast for south Puget Sound used 1993-1997. The Hood Canal forecast was an average of smolts produced multiplied by the 1991-1996 average marine survival and the average number of Hood Canal December age-two recruits multiplied by the number of brood 1995 Big Beef Creek smolts. The Strait of Juan de Fuca stocks were forecast using the mean recruit per spawner ratios for 1989-1996 multiplied by the parent brood escapement. The Skagit wild coho forecast was derived using the average of return years 1992-1996 (December age-two recruits Council marine survival) times the estimated smolts produced for brood year 1995 and adjusted to account for underestimates of escapements during the base years of 1979-1981.

Detailed descriptions of these methodologies are available in the 1998 Puget Sound Coho Salmon Forecast Methodology report available through the Washington Department of Fish and Wildlife and the Northwest Indian Fisheries Commission.

SELECTIVE FISHERY CONSIDERATIONS

As the region has moved forward with mass marking of hatchery coho salmon stocks, selective fishing options are an important consideration for fishery managers. Table III-4 summarizes estimates of mass mark rates for coho stocks from Southern British Columbia to the Oregon coast, based on preseason abundance forecasts. Agencies have released coho mass marked with adipose (Washington and Oregon production)

TABLE III-4. Mass marking of 1995 brood coho available to 1998 Council fisheries in thousands of fish.

	Ocean Recruits					
Region	Wild	Hatchery	Percent of Total Mass Marked	Type of Mark	Percent of Total Mass Marked	Type of Mark
Nooksack-Samish & 7/7A Independent	30.8	119.1	9.0%	Adipose fin clip		
Skagit	55.0	12.9	15.0%	Adipose fin clip		
Stillaguamish-Snohomish	213.1	47.1	3.1%	Adipose fin clip		
South Puget Sound Normal	57.2	223.9	15.6%	Adipose fin clip		
South Puget Sound Delayed	0.0	184.8	10.4%	Adipose fin clip		
Hood Canal	120.7	82.6	13.2%	Adipose fin clip		
Strait of Juan de Fuca & Area 9	17.6	27.4	1.9%	Adipose fin clip		
Puget Sound Total	494.4	697.9	10.3%			
Makah	0.4	2.9	24.1%	Adipose fin clip		
North Coast Independent Tributaries	2.9	0.0	0.0%	Adipose fin clip		
Quillayute Summer	1.3	1.8	16.5%	Adipose fin clip		
Quillayute Fall	8.0	4.4	5.9%	Adipose fin clip		
Hoh	3.5	0.0	0.0%	Adipose fin clip		
Queets	5.6	4.6	11.2%	Adipose fin clip		
Quinault	6.5	3.9	4.8%	Adipose fin clip		
Grays Harbor	30.1	25.6	40.3%	Adipose fin clip		
Willapa Bay	3.3	20.8	80.5%	Adipose fin clip		
Washington Coastal Total	61.6	64.1	36.3%			
Columbia River Early	0.0	63.8	78.8%	Adipose fin clip		
Columbia River Late	0.0	24.9	79.4%	Adipose fin clip		
Columbia River Total	0.0	88.7	79.1%			
Oregon Coastal	47.2	29.7	36.8%	Adipose fin clip		
West Coast Vancouver Island	183.8	12.4	0.3%	Adipose/Adipose-Left Ventral		
Southeast Vancouver Island	10.5	0.0	0.0%	Adipose/Adipose-Left Ventral		
Southeast Vancouver Island Resident	16.5	0.0	0.0%	Adipose/Adipose-Left Ventral		
Quinsam	20.3	10.9	2.4%	Adipose/Adipose-Left Ventral		
Quinsam Resident	19.2	10.3	2.4%	Adipose/Adipose-Left Ventral		
Puntledge	19.5	4.0	2.1%	Adipose/Adipose-Left Ventral	15.1%	Ventral Fin
Puntledge Resident	27.7	5.7	2.1%	Adipose/Adipose-Left Ventral	15.1%	Ventral Fin
Big Qualicum	17.9	8.5	1.9%	Adipose/Adipose-Left Ventral	24.1%	Ventral Fin
Big Qualicum Resident	41.9	19.8	1.9%	Adipose/Adipose-Left Ventral	24.1%	Ventral Fin
Capilano	0.8	4.5	14.6%	Adipose/Adipose-Left Ventral	59.1%	Ventral Fin
Capilano Resident	1.9	11.2	14.6%	Adipose/Adipose-Left Ventral	59.1%	Ventral Fin
Fraser	70.0	36.0	3.4%	Adipose/Adipose-Left Ventral	28.9%	Ventral Fin
Fraser Resident	133.4	68.7	3.4%	Adipose/Adipose-Left Ventral	28.9%	Ventral Fin
Southern British Columbia Total	563.3	192.1	2.4%		27.5%	

and ventral fin (Southern British Columbia) clips from the 1995 brood, making these fish available to 1998 fisheries.

The mark rate is highest for Columbia River stocks, but due to low abundance projections, selective fishing opportunities do not appear to be available if hatchery escapement goals are to be achieved.

EVALUATION OF 1997 REGULATIONS ON 1998 STOCK ABUNDANCE

Oregon Production Index Area

Ocean fisheries were modeled based on 1997 regulations after fishery levels were adjusted due to expected WCVI coho fisheries of 1.04 million and using 1998 preseason abundance predictions. Under this scenario, the expected exploitation rate on OCN coho is 21.5%. The expected OCN spawner escapement is 35,600 adults. The actual OCN spawner escapement under 1997 regulations and 1998 abundances likely would be somewhat different, because the expected harvests in British Columbia ocean fisheries and ocean impacts in Council area fisheries would change from 1997 expectations. Escapements and fishery impacts were estimated using the FRAM (Table III-5).

Based on parent escapement levels and observed low marine survival, the total allowable OCN coho exploitation rate for 1998 fisheries is no greater than ten percent to 13% under Amendment 13 (see Appendix A, Tables A-2 and A-3).

Ocean escapements into the Columbia River in 1998 would not be sufficient to provide for treaty Indian obligations, limited inside non-Indian fisheries, and meet hatchery requirements under 1997 ocean fishing regulations.

North of the Oregon Production Index Area

Ocean escapement expectations for selected critical coho stocks under 1997 planned catch levels and regulations with the 1998 preseason abundance forecasts are presented in Table III-5. These expectations assumed ocean catches and impacts equal to 1997 expected preseason levels for all Council fisheries. In addition, expected 1997 preseason regulations, harvest patterns and catch ceilings for U.S. inside water fisheries (e.g., Puget Sound) and Canadian fisheries (e.g., WCVI troll) are assumed.

Escapements and fishery impacts were estimated using FRAM, the fishery impact model used by the STT for the 1997 preseason assessment. The ocean fishery management goals for Council area coho stocks are listed in Appendix A, Table A-1.

Ocean escapements for many natural coho stocks north of the OPI index area would not be sufficient to meet their spawning escapement goals under 1997 regulations. The Stillaguamish River natural coho stock would be expected to have an ocean escapement of 13,700 coho, compared to the spawning escapement goal of 17,000 fish. The Strait of Juan de Fuca natural coho stock would have an ocean escapement of 3,000 fish compared to the spawner goal of 12,800 fish. The Skagit River natural coho stock would be expected to have an ocean escapement of 17,400 coho, compared to the spawning escapement goal of 30,000 fish. Hood Canal natural coho have shown significant improvement in the last two years and would not be a critical stock with an ocean escapement of 34,000 fish. Impacts associated with planned 1997 inside fisheries would result in spawning escapements for Strait of Juan de Fuca, Hood Canal, and Stillaguamish natural coho of 1,200; 25,200; and 11,200 fish, respectively.

On the Washington coast, the Queets natural stock ocean escapement would be 2,100 coho, compared to an escapement range of 5,800 to 14,500 fish. The Hoh natural coho stocks would have an ocean escapement of 1,400 fish, compared to an escapement range of 2,000 to 5,000 fish. The Quillayute falls natural coho stock would have an ocean escapement of 3,300 fish, compared to the spawning escapement range of 6,300 to 15,800 fish. The Grays Harbor natural coho stock ocean escapement would be 12,800 fish, compared to the spawning escapement goal of 35,400 fish.

Fishery impact levels depicted in this analysis reflect preseason assumptions for the analysis of 1997 adopted regulations. Of special note is the Canadian WCVI troll number of 1.04 million coho which was used in this model run. The impacts for this fishery in 1998 are expected to be considerably lower due to continuing concern for depressed coho stocks from southern British Columbia.

TABLE III-5. Comparison of 1998 estimated ocean escapements for critical natural and Columbia River hatchery coho stocks under 1997 Council regulations with 1997 and preliminary 1998 preseason abundance forecasts.[a/] (Page 1 of 1)

Stock	Ocean Escapement Estimates[b/] 1998 Preseason Abundance	1997 Preseason Abundance[c/]	1998 Spawning Escapement Goal[d/]
	COHO (thousands)		
Natural Coho Stocks			
Skagit	17.4	34.2	30
Stillaguamish	13.7	15.7	17
Snohomish	47.3	81.5	70
Hood Canal	34.0	38.0	21.5
Strait of Juan de Fuca	3.0	2.2	12.8
Quillayute Fall	3.3	5.1	6.3-15.8
Hoh	1.4	1.6	2.0-5.0
Queets	2.1	2.4	5.8-14.5
Grays Harbor	12.8	14.8	35.4
OCN	35.6	73.3	e/
Hatchery Stocks			
Columbia Early	35.8	163.9	34.1[f/]
Columbia Late	12.8	63.5	30.6[f/]

a/ Quota levels include harvest and hooking mortality estimates used in planning the Council's 1997 ocean fisheries and a coho catch for the Canadian troll fishery off the West Coast of Vancouver Island (WCVI).

b/ Ocean escapement is generally the estimated number of coho escaping ocean fisheries and entering freshwater. For Puget Sound stocks, ocean escapement is the estimated number of coho entering Area 4B which are available for U.S. net fisheries in Puget Sound and spawning escapement after impacts associated with the Canadian and Puget Sound troll and recreational fisheries have been deducted. For the OCN coho stock, this value represents the estimated spawner escapement in SRS accounting. For Columbia River hatchery stocks, ocean escapement represents the number of coho after the Buoy 10 fishery.

c/ Based on a Canadian catch of 1.04 million coho off of WCVI.

d/ Spawning escapement goals are not directly comparable to ocean escapement, because inside fishery harvest is not considered.

e/ From 1994-1997 the long-term goal (under Amendment 11) was 42 adults per mile on standard index surveys. Beginning in 1998, the goal has been modified by Amendment 13. For 1998, the goal is to allow a freshwater and marine harvest exploitation rate no greater than 10-13%, based on low parent escapement and poor marine survival.

f/ Number of coho necessary to enter the Columbia River to achieve hatchery egg-take goals, assuming normal distribution patterns and no mainstem or tributary fisheries. The 1998 hatchery rack return goals are 18,800 and 17,200 adult coho for the early and late stocks, respectively.

CHAPTER IV
FRASER RIVER AND PUGET SOUND PINK SALMON ASSESSMENTS

Two major stocks comprise the pink salmon population available to Council ocean fisheries during odd-numbered years. Table IV-1 provides a summary of recent run sizes.

The more abundant of the two runs originates from the Fraser River in British Columbia. Average run size for the period 1977-1995 (odd numbered years only) is approximately 14.6 million, ranging from 7 million in 1987 to 19 million in 1985. Fraser River pink salmon forecasts have been based on the relationship of fry index values and sea surface salinity at the time of juvenile emigration.

The ocean abundance of Puget Sound pink salmon stocks has averaged 2.1 million during the period 1977-1995 (odd numbered years only), ranging from 1.0 million in 1983 to 3.7 million in 1989. Forecasts of abundance are based on cyclic relationships of adult production and parent spawner abundance. Cyclic survival rates for 1995 are the highest in the forecasting data base.

STOCK STATUS IN 1998

No forecasts are available for even-numbered year pink salmon abundance in Council area fisheries. Incidental harvests in even-numbered years have been less than 500 fish per year since 1980.

TABLE IV-1. Actual run sizes (odd numbered years 1977-1997) for Fraser River and Puget Sound pink salmon in millions of salmon. (Page 1 of 1)

Year	Puget Sound[a/]	Fraser River[b/]
1977	0.86	8.21
1979	1.31	14.40
1981	0.48	18.68
1983	1.00	15.35
1985	3.01	19.04
1987	2.59	7.17
1989	3.70	16.67
1991	2.28	16.67
1993[c/]	2.75	17.43
1995[d/]	3.43	12.50
1997[d/]	NA	8.28

a/ For 1977-1983, the number in this column represents the Puget Sound run size after Canadian and U.S. ocean fisheries. Numbers after 1983 represent total Puget Sound run size.
b/ Total run size.
c/ Preliminary estimate. Area 4B run size adjusted for an average 1989-1991 interception rate of 24.6 percent.
d/ Preliminary estimate. Likely to be adjusted when GSI bias-correction methodologies are finalized.

APPENDIX A
SUMMARY OF COUNCIL STOCK MANAGEMENT GOALS

LIST OF TABLES

TABLE A-1. Summary of management goals for stocks in the Council's salmon management unit (**as revised by Amendments 9; 12, and 13, and Salmon Technical Team review of the goal for Klamath River fall chinook in 1989 and 1996**). (Page 1 of 2)

Stock or System	Spawner Escapement Goal[a/]	Other Management Objectives
	CHINOOK SALMON	
Sacramento River Fall Chinook	122,000 to 180,000 natural and hatchery.[b/]	Provide for inside recreational fishery.
Klamath River Fall Chinook	Between 33 and 34% of the potential adult natural spawners, but no fewer than 35,000 naturally spawning adults in any one year. The brood escapement rate will average 33 to 34% over the long term, but an individual brood may vary from this range to achieve the required tribal/non-tribal annual allocation. (**Amendment 9 and STT technical review**)	Ocean and inriver fisheries management based on allowable harvest rate combination, except as needed to protect the escapement floor and meet the tribal/nontribal harvest allocation.
Oregon Coastal Chinook	150,000 to 200,000 natural adults.[c/]	Meet hatchery requirements.
Columbia River Chinook		Manage consistent with: Pacific Salmon Treaty Act, treaty Indian obligations, ESA Section 7 consultations for Snake River spring/summer and fall chinook, inside non-Indian fisheries needs, the Willamette Plan and hatchery requirements. In addition to the Council's goals, a Lewis River management objective of 5,700 adult spawners has been identified for the lower river wild stock.
Upper River Fall (Brights)	40,000 bright adults above McNary Dam.	
Upper River Summer	80,000 to 90,000 adults above Bonneville Dam.	
Upper River Spring	115,000 adults above Bonneville Dam.	
Lower River Fall (Tule)	Meet hatchery requirements.	
Lower River Spring (Willamette River)	30,000 to 45,000 based on run size.	
Washington Coastal Fall Chinook	d/e/	Meet treaty Indian allocation requirements, provide fish for inside non-Indian needs.
Washington Coastal Spring-Summer Chinook	d/e/	Same as Washington coastal fall chinook.
Puget Sound Chinook	d/e/	Same as Washington coastal fall chinook.
	COHO SALMON	
Oregon Coastal Coho	For each of 4 stock components (northern, north-central, south-central, and southern): no less than 65 to 90% of the potential adult natural spawners escaping marine and freshwater fisheries; the actual percentage depending on parent abundance and projected marine survival at three levels each (high, medium, and low), as detailed in Table A-2.	None.
Columbia River Coho	Meet hatchery egg-take goals.	Provide for Columbia River treaty Indian obligations, inside non-Indian fisheries, and meet hatchery requirements.
Washington Coastal Coho	d/	Meet treaty Indian obligation requirements, provide fish to inside non-Indian fisheries, and meet hatchery requirements.
Puget Sound Coho	d/	Same as Washington coastal coho.
Southern British Columbia Coho	Not clearly established.	Manage consistent with U.S.-Canada treaty.
	PINK AND SOCKEYE SALMON	
Puget Sound Pink	900,000 natural spawners in odd-numbered years.	Meet treaty Indian obligation requirements.
Fraser River Pink and Sockeye	f/	Manage consistent with chinook and coho escapement needs.
Lake Washington Sockeye	350,000 to Lake Washington.[e/]	Meet treaty Indian allocation requirements.[g/]
Columbia River Sockeye	65,000 over Priest Rapids.	g/

TABLE A-1. Summary of management goals for stocks in the Council's salmon management unit (**as revised by Amendments 9; 12, and 13, and Salmon Technical Team review of the goal for Klamath River fall chinook in 1989 and 1996**). (Page 2 of 2)

Stock or System	Spawner Escapement Goal[a/]	Other Management Objectives
ALL SALMON SPECIES (Amendment 12)		
Species listed under the ESA[h/]	Manage consistent with NMFS jeopardy standards or recovery plans to meet immediate conservation needs and the long-term recovery of the species.[i/]	None.

a/ Represents adult natural spawner escapement goal for viable natural stocks or adult hatchery return goal for stocks managed for artificial production.

b/ Includes upper and lower river components and is presented as a range within which annual escapements can be expected to vary. The State of California has established a distribution goal for each river system which contributes to the aggregate Central Valley fall chinook goal. These distribution goals are not used as a basis for ocean management, but will be used as management goals by agencies having inriver management responsibilities. The distribution goals are listed in Section 6.2.1 of the salmon FMP.

c/ Specific goals have not been established for individual river systems. When goals are established for spring and fall runs as well as north and south coast stocks, they may be incorporated in the plan without the need for a formal amendment.

d/ Annual management objectives (expected hatchery plus natural escapement) for specific rivers or regions of origin are developed through procedures established in the U.S. District Court. The total escapement objective is based upon either maximum sustained harvest spawning escapement goals for stocks managed primarily for natural production (Grays Harbor, Queets, Hoh, Quillayute, Strait of Juan de Fuca, Skagit, Stillaguamish/Snohomish, and Hood Canal) or upon hatchery escapement needs for stocks managed for artificial production. Total escapement objectives for each stock are established annually based on the appropriate goal. Puget Sound procedures are outlined in "Memorandum Adopting Salmon Plan" (U.S. v. Washington, 459 F. Supp. 1020 [1978]). Washington north coastal coho procedures are established in U.S. District Court order Hoh v. Baldrige No. 81-742 (R) C.

e/ These stocks represent a minor component of the Washington ocean harvest although ocean impact relative to terminal run size for each stock can be a management consideration.

f/ Fraser River pink and sockeye salmon are managed primarily under jurisdiction of the Fraser River Panel of the Pacific Salmon Commission which includes control of ocean harvests north of 48°N latitude. State control of landings may be used to control potential impacts on coho or chinook during pink and/or sockeye fisheries.

g/ These stocks represent a negligible component of the Washington ocean harvest.

h/ The Council must meet or exceed the requirements of the ESA which is other applicable law. Considerations for listed species first became necessary in 1990 after Sacramento winter chinook were classified as threatened. Similar consideration first became necessary for Snake River sockeye and chinook salmon species in 1992. Other salmon species may be listed in the future.

i/ In so far as is practical while not compromising its ability to meet the requirements of the ESA, the NMFS will endeavor to provide opportunity for Council and peer review of any proposed jeopardy standards, or the objectives of recovery plans, well prior to their implementation. Such review would ideally commence no later than the last Council meeting in the year immediately preceding the first salmon season in which the standards would be implemented.

TABLE A-2. Council-adopted, allowable harvest impact rate criteria for OCN coho stock components.

PARENT SPAWNER STATUS[a/]	SMOLT TO ADULT MARINE SURVIVAL (Estimated by Hatchery Smolt to Jack Survival) Low (<0.09%)	Medium (0.09-0.34%)	High (>0.034%)
	ALLOWABLE TOTAL FISHERY IMPACT		
High: Parent spawners achieved Level #2 rebuilding criteria; grandparent spawners achieved Level #1	≤15%	≤30%	≤35%
Medium: Parent spawners achieved Level #1 or greater rebuilding criteria	≤15%	≤20%	≤25%
Low: Parent spawners less than Level #1 rebuilding criteria	≤15%	≤15%	≤15%
When parent spawners are less than 38% of the Level #1 rebuilding criteria, or when marine survival conditions are at an extreme low as in 1994-1996 (<0.06% hatchery smolt to jack survival).	≤10-13%		

Rebuilding Criteria	OCN Coho Spawners by Stock Component: Northern	North-Central	South-Central	Southern
38% of Level #1:	4,100	10,500	9,500	1,000
Level #1:	10,900	27,500	25,000	2,700
Level #2:	16,400	41,300	37,500	4,100
Full Seeding:	21,800	55,000	50,000	5,400

a/ In the event that a spawner criteria is achieved, but a major basin within the stock component is less than ten percent of the full seeding level, the next tier of additional harvest would not be allowed in mixed-stock fisheries for that component, nor additional impacts within that particular basin (see Table A-4 in Appendix A for a list of major basins within stock components).

TABLE A-3. Maximum allowable fishery impact rate for OCN coho under Amendment 13 based on parent escapement levels by stock component and marine survival category.

Fishery Year (t)	Parent Escapement Year (t-3)	Estimated OCN Coho Spawners by Stock Component: Northern	North-Central	South-Central	Southern	Hatchery Jack Survival Rate (t-1)	Marine Survival Category	Maximum allowable Fishery Impact Rate
1998	1995	3,700	13,600	34,800	4,200	0.04%	Low	10-13%
1999	1996	3,400	18,800	56,200	5,400	NA	NA	NA
2000	1997	2,500	3,400	17,900	7,800	NA	NA	NA

TABLE A-4. Estimated coho salmon natural spawner abundance (SRS accounting) in Oregon coastal basins for each OCN coho management component. Estimates adjusted for visual observation bias by multiplying estimate by 1.33 . (Page 1 of 1)

Component and Basin	Miles	Adjusted SRS Natural Coho Spawner Estimates								
		1990	1991	1992	1993	1994	1995	1996	1997[a]	1990-1997 Mean
NORTHERN:										
Nehalem	386	1,552	3,975	1,268	2,265	2,369	1,564	1,057	2,171	2,028
Tillamook	249	265	3,000	261	860	924	275	661	409	832
Nestucca	167	189	728	684	401	313	1,811	519	256	613
Direct Ocean Tributaries	97	191	1,579	209	983	485	319	1,043	263	634
TOTAL	899	2,197	9,282	2,422	4,509	4,091	3,969	3,280	3,099	4,106
NORTH CENTRAL:										
Siletz	118	441	984	2,447	400	1,200	607	763	329	896
Yaquina	109	381	380	633	549	2,448	5,668	5,127	525	1,964
Alsea	221	1,189	1,561	7,029	1,071	1,279	681	1,637	919	1,921
Siuslaw	514	2,685	3,740	3,440	4,428	3,044	6,089	7,625	655	3,963
Direct Ocean Tributaries	201	895	67	1,821	1,331	1,743	573	2,975	939	1,293
TOTAL	1,163	5,591	6,732	15,370	7,779	9,714	13,618	18,127	3,367	10,037
SOUTH CENTRAL:										
Umpqua	1,083	3,737	3,600	2,152	9,311	4,485	11,020	9,749	2,387	5,805
Coos	208	2,273	3,813	15,625	15,284	14,583	10,447	12,128	1,147	9,413
Coquille	331	2,712	5,651	2,116	7,384	5,035	2,116	16,169	5,428	5,826
Coastal Lakes	-	4,393	7,251	1,986	10,145	5,841	11,216	13,493	8,603	7,866
TOTAL	1,622	13,115	20,315	21,879	42,124	29,944	34,799	51,539	17,565	28,910
SOUTH:										
Rogue[b]	-	2,796	765	1,935	174	5,303	4,221	5,386	7,783	3,545
COASTWIDE	-	23,699	37,094	41,606	54,586	49,052	56,607	78,332	31,814	46,599

a/ Estimates for 1997 are preliminary and are not adjusted for the presence of hatchery fish.
b/ Mark recapture estimate based on seining at Huntley Park in the lower Rogue River.

APPENDIX B
OREGON PRODUCTION INDEX DATA

LIST OF TABLES

TABLE B-1. Preliminary 1985-1997 preseason and postseason coho stock index abundance estimates for OPI area stocks in thousands of fish.[a/] (Page 1 of 2)

Stock	Year	Preseason	Postseason	Preseason/ Postseason
OPIH	1985	476.6	657.4	0.73
	1986	1,544.9	2,381.7	0.65
	1987	565.4	817.1	0.69
	1988	1,591.0	1,556.4	1.02
	1989	1,381.5	1,620.0	0.85
	1990	909.6	594.2	1.53
	1991	1,215.4	1,802.9	0.67
	1992	385.3	472.8	0.81
	1993	479.2	222.8	2.15
	1994	98.3	202.7	0.49
	1995	218.0	134.8	1.62
	1996	245.5	174.3	1.41
	1997	289.2	191.7	1.51
Total OCN				
	1986	304.0	291.4	1.04
	1987	476.0	197.1	2.42
	1988	480.3	352.9	1.36
	1989	446.2	315.5	1.41
	1990	321.0	283.9	1.13
	1991	421.9	255.5	1.65
	1992	265.7	256.6	1.04
	1993	283.3	251.9	1.12
	1994	140.9	134.1	1.05
	1995	219.0	159.0	1.38
	1996	181.3	236.5	0.77
	1997	247.9	77.3	3.21
OCNR	1985	296.0	303.4	0.98
	1986	285.6	273.4	1.04
	1987	458.0	187.1	2.45
	1988	464.3	340.2	1.36
	1989	430.0	305.1	1.41
	1990	307.5	271.9	1.13
	1991	409.2	241.8	1.69
	1992	255.0	252.9	1.01
	1993	273.9	236.8	1.16
	1994	134.4	128.1	1.05
	1995	211.1	145.5	1.45
	1996	169.7	221.5	0.77
	1997	236.3	67.6	3.50
OCNL	1985	6.6[b/]	12.6[c/]	0.52
	1986	18.4[b/]	18.0[c/]	1.02
	1987	18.0	10.0	1.80
	1988	16.0	12.7	1.26
	1989	16.2	10.5	1.54
	1990	13.5	12.0	1.13
	1991	12.7	13.8	0.92
	1992	10.7	3.7	2.89
	1993	9.4	15.1	0.62
	1994	6.5	6.0	1.08
	1995	7.9	13.6	0.58
	1996	11.6	15.1	0.77
	1997	11.6	9.7	1.20

TABLE B-1. Preliminary 1985-1997 preseason and postseason coho stock index abundance estimates for OPI area stocks in thousands of fish.[a/] (Page 2 of 2)

Stock	Year	Preseason	Postseason	Preseason/ Postseason
PRIH	1985	96.8	424.4	0.23
	1986	285.5	584.9	0.49
	1987	465.6	300.1	1.55
	1988	302.5	229.0	1.32
	1989	206.4	104.8	1.97
	1990	142.8	124.3[d/]	1.15
	1991	37.1	60.4[d/]	0.61
	1992	0.0	0.0	-
	1993	0.0	0.0	-
	1994	0.0	0.0	-
	1995	0.0	0.0	-
	1996	0.0	0.0	-
	1997	0.0	0.0	-
STEP	1985	-	-	-
	1986	-	-	-
	1987	6.1	0.5	13.48
	1988	0.4	2.6	0.15
	1989	5.2	2.5	2.12
	1990	3.5	4.3	0.81
	1991	6.9	8.6	0.80
	1992	1.7	1.1	1.62
	1993	4.5	3.0	1.50
	1994	0.5	1.8	0.28
	1995	6.0	0.5	12.00
	1996	0.3	1.1	0.27
	1997	1.0	0.3	3.33

a/ Estimates for 1988-1995 use the Council-adopted revised abundance procedure developed in 1987, except for the OCNR predictor which was revised in 1992 and was based on an alternative environmental predictor during 1994-1997. Also, the OPIH predictor was fit through zero in 1994 and 1995.
b/ This estimate is for the Ten Mile Lake system only.
c/ Includes postseason estimate for the Ten Mile, Siltcoos and Tahkenitch lake systems.
d/ Estimated harvest occurring outside the OPI area is not available.

TABLE B-2. Millions of coho smolts released annually into the OPI area by geographic area and rearing agency.[a/] (Page 1 of 1)

	Columbia River						Oregon Coast						
		Washington						Private Aquaculture					
Year	Oregon[b/]	Toutle[b/]	Cowlitz[c/]	Combined	Federal	Total	ODFW[d/]	Yearlings	Zeros	Combined	Total	California	Total OPI
1960	2.2	-	-	2.5	1.7	6.4	1.0	-	-	-	1.0	0.0	7.4
1961	4.6	-	-	6.3	4.2	15.1	1.4	-	-	-	1.4	0.1	16.6
1962	6.7	-	-	5.5	2.3	14.5	2.5	-	-	-	2.5	0.4	17.4
1963	6.5	-	-	8.0	7.9	22.4	2.7	-	-	-	2.7	0.5	25.6
1964	6.9	-	-	6.5	4.6	18.0	2.3	-	-	-	2.3	0.5	20.8
1965	6.4	-	-	7.8	6.4	20.6	2.1	-	-	-	2.1	1.1	23.8
1966	6.0	-	-	12.1	6.5	24.6	2.1	-	-	-	2.1	0.7	27.4
1967	7.0	-	-	8.5	8.6	24.1	2.4	-	-	-	2.4	1.3	27.8
1968	5.5	-	-	6.6	7.2	19.3	3.2	-	-	-	3.2	1.8	24.3
1969	6.3	10.5	5.2	15.7	5.6	27.6	3.4	-	-	-	3.4	1.4	32.4
1970	5.2	9.8	4.6	14.4	4.4	24.0	3.4	-	-	-	3.4	1.4	28.8
1971	7.2	13.5	3.1	16.6	4.5	28.2	4.1	-	-	-	4.1	1.0	33.3
1972	6.9	13.6	5.2	18.8	4.2	29.9	3.8	-	-	-	3.8	1.6	35.3
1973	6.3	11.1	5.9	17.0	5.2	28.5	3.9	-	-	-	3.9	1.2	33.6
1974	6.9	9.5	7.2	16.7	4.3	27.9	4.1	-	0.1	0.1	4.2	0.6	32.7
1975	6.6	5.9	12.4	18.3	4.1	29.0	3.4	-	0.1	0.1	3.5	1.6	34.1
1976	8.2	5.6	10.9	16.5	4.2	28.9	4.0	0.7	1.4	2.1	6.1	0.6	35.6
1977	8.4	6.4	10.6	17.0	6.0	31.4	3.2	1.1	1.3	2.4	5.6	0.9	37.9
1978	9.1	10.2	8.0	18.2	5.3	32.6	4.0	0.3	9.6	9.9	13.9	0.5	47.0
1979	8.8	8.2	9.1	17.3	2.8	28.9	4.5	0.9	4.9	5.8	10.3	0.8	40.0
1980	5.5	5.9[e/]	11.7	17.6	5.0	28.1	3.4	4.1	10.7	14.8	18.2	0.8	47.1
1981	5.9	8.6[e/]	14.2	22.8	3.7	32.5	3.9	6.6	17.3	23.9	27.8	0.9	61.2
1982	5.6	4.0	14.9	18.9	3.3	27.8	4.3	3.2	19.9	23.1	27.4	0.6	55.8
1983	6.2	2.4	15.0	17.4	3.4	27.0	3.0	1.3	14.8	16.1	19.1	0.9	47.0
1984	8.9	2.5	14.2	16.7	3.6	29.3	4.5	1.4	9.5	10.9	15.4	0.7	45.4
1985	9.1	3.9	13.8	17.7	2.0	28.8	3.8	4.2	4.4	8.6	12.5	0.2	41.5
1986	9.1	3.8	15.3	19.1	4.7	32.9	4.8	3.1	5.5	8.6	13.4	1.8	48.1
1987	6.8	3.3	15.4	18.7	3.3	28.8	4.9	0.5	4.1	4.6	9.5	1.3	39.6
1988	6.2	2.8	16.1	18.9	4.5	29.5	5.3	1.1	3.7	4.8	10.1	1.2	40.8
1989	6.6	2.5	17.0	19.5	3.5	29.6	5.0	2.0	8.0	10.0	15.0	1.3	45.9
1990	8.0	3.3	14.3	17.6	4.7	30.3	5.7	2.8	2.8	5.6	11.3	1.2	42.8
1991	10.4	3.7	15.3	19.0	5.9	35.3	5.3	0.0	0.0	0.0	5.3	1.5	42.1
1992	11.5	4.3	14.3	18.6	2.7	32.8	6.2	0.0	0.0	0.0	6.2	0.7	39.7
1993	11.1	4.3	14.8	19.1	4.2	34.4	4.3	0.0	0.0	0.0	4.3	0.8	39.5
1994	9.1	2.5	12.0	14.5	3.0	26.6	5.0	0.0	0.0	0.0	5.0	0.6	32.3
1995	7.1	3.4	12.9	16.3	1.7	25.2	3.7	0.0	0.0	0.0	3.7	0.7	29.5
1996	8.4	3.4	12.9	16.3	3.4	28.0	3.3	0.0	0.0	0.0	3.3	0.3	31.6
1997[f/]	6.1	3.2	7.8	11.0	3.9	21.0	2.9	0.0	0.0	0.0	2.9	0.7	24.6

a/ A coho smolt is here defined as 30 fish per pound or larger and released in February or later.
b/ All releases are of early run (Toutle River) stock.
c/ All releases are of late run (Cowlitz River) stock.
d/ Beginning in 1989, does not include minor releases from STEP projects.
e/ Excludes 3.5 million assumed lost at Toutle Hatchery on May 18, 1980, during the eruption of Mt. Saint Helens.
f/ Preliminary.

TABLE B-3. Data set used in predicting 1998 Oregon production index hatchery (OPIH) adult coho. Adults and jacks shown in thousands of fish and smolts in millions of fish.[a/] (Page 1 of 1)

Year (t)	Adult OPIH (t)	Jack CR (t-1)	Jack OC (t-1)	Sm CR (t-1)	Sm D (t-1)
1970	2,503.8	148.6	13.6	27.6	0.0
1971	2,679.1	172.8	6.6	24.0	0.0
1972	1,578.3	100.8	2.9	28.3	0.0
1973	1,498.8	85.7	5.7	29.9	1.8
1974	2,678.9	132.1	12.1	28.5	2.9
1975	1,314.6	75.1	1.1	27.8	1.8
1976	3,149.2	146.2	25.3	29.0	2.0
1977	759.6	46.2	7.5	28.9	0.2
1978	1,617.7	99.2	4.0	31.4	0.0
1979	1,160.8	64.1	8.4	32.6	5.0
1980	1,065.2	51.6	6.0	28.9	6.7
1981	938.6	40.6	8.1	28.1	5.6
1982	1,196.1	55.0	6.3	32.4	6.8
1983[b/]	504.5	61.0	7.2	27.7	5.0
1984	646.1	28.1	3.6	27.0	5.1
1985	657.4	18.2	7.8	29.2	9.1
1986	2,381.7	64.7	12.9	28.8	12.2
1987	817.1	24.1	8.7	32.9	9.0
1988	1,556.4	72.2	12.9	28.8	7.7
1989	1,620.0	55.0	5.8	29.5	7.2
1990	594.2	37.1	9.6	29.6	8.5
1991	1,802.9	60.8	7.9	30.3	7.1
1992	472.8	19.9	5.7	35.3	6.0
1993	222.8	19.7	7.5	32.8	5.5
1994	202.7	3.8	1.3	34.4	6.0
1995	134.8	9.1	2.7	26.6	3.1
1996	174.3	14.1	3.2	25.2	4.2
1997	260.6	15.8	4.6	28.0	3.4
1998	71.8[c/]	6.8	3.0	21.0	2.5

a/ Adult OPIH = Harvest impacts plus escapement for public hatchery stocks originating in the Columbia River, Oregon coastal rivers and the Klamath River, California.
Jack CR = Columbia River jack returns corrected for small adults.
Jack OC = Oregon coastal and California hatchery jack returns corrected for small adults.
Sm CR = Columbia River smolt release.
Sm D = Columbia River delayed smolt releases.
b/ Data not used in the analysis due to El Niño impacts.
c/ Preseason predicted adults.

TABLE B-4. Data set used in predicting 1998 Oregon coastal natural river (OCNR) coho recruits by SRS accounting. Recruits shown in thousands of fish. (Page 1 of 1)

Year	Recruits to Ocean	Ln (Recruits)	JanAnom[a/]	UpAnom (t-1)[a/]
1990	60.4	4.10099	-0.004	-21.92
1991	70.1	4.24992	-1.104	-37.92
1992	85.8	4.45202	0.096	43.08
1993	81.1	4.39568	0.196	7.08
1994	39.2	3.66868	1.096	-50.92
1995	53.9	3.98713	0.596	-3.92
1996	70.1	4.24992	1.296	-1.92
1997	17.9	2.88480	0.596	9.08
1998	34.4[b/]	3.53710	2.096	-24.92

a/ JanAnom = the annual deviation from mean (1971-1996) January sea surface temperature (degrees Centigrade) at Charleston, Oregon.
UpAnom = Annual deviation from mean (1970-1995) April-June Bakun upwelling index at 42° N.
b/ Preseason predicted SRS recruits.

APPENDIX C
CAPE FLATTERY AND STRAIT OF JUAN DE FUCA HISTORICAL CHINOOK SALMON CATCHES

LIST OF TABLES

TABLE C-1. Salmon catches in numbers of fish from the Cape Flattery and Strait of Juan de Fuca areas, by gear and species. (Page 1 of 4)

Area and Year	Treaty Indian			Non-Indian				Grand Total
	Troll	Net	Total	Troll	Net	Sport[a/]	Total	
CHINOOK LANDINGS								
Areas 4 and 4A								
1979	408	3	411	26,549	0	3,058	29,607	30,018
1980	2,388	1,211	3,599	22,252	0	2,836	25,088	28,687
1981	3,666	209	3,875	17,267	0	3,207	20,474	24,349
1982	12,714	267	12,981	16,509	0	3,180	19,689	32,670
1983	2,899	62	2,961	9,547	0	2,452	11,999	14,960
1984	2,086	0	2,086	2,326	0	229	2,555	4,641
1985	6,765	493	7,258	4,414	0	2,052	6,466	13,724
1986	5,208	87	5,295	4,656	0	3,248	7,904	13,199
1987	9,480	3,681	13,161	4,838	0	2,599	7,437	20,598
1988	13,298	2,991	16,289	21,941	-	3,767	25,708	41,997
1989	15,278	780	16,058	282	-	2,077	2,359	18,417
1990	13,625	30	13,655	16,286	-	2,258	18,544	32,199
1991	16,103	235	16,338	15,238	-	2,465	17,703	34,041
1992	17,384	9	17,393	17,076	-	1,082	18,158	35,551
1993	19,858	24	19,882	16,115	-	1,466	17,581	37,463
1994	1,957	4	1,961	-	-	-	-	1,961
1995[b/]	7,489	2	7,491	3	-	110	113	7,604
1996[b/]	9,690	13	9,703	0	-	55	55	9,758
1997[b/]	11,531	0	11,531	3,785	-	478	4,263	15,794
Area 4B								
1979	8,436	2,396	10,832	214	1,402	-	1,616	12,448
1980	10,712	4,561	15,273	0	368	-	368	15,641
1981	15,950	4,899	20,849	2	542	-	544	21,393
1982	19,605	4,712	24,317	293	1,699	-	1,992	26,309
1983	20,102	7,009	27,111	8	264	-	272	27,383
1984	14,627	1,460	16,087	3	18	-	21	16,108
1985	7,524	3,394	10,918	2	279	-	281	11,199
1986	5,863	6,445	12,308	0	39	-	39	12,347
1987	11,341	3,982	15,323	-	5	-	5	15,328
1988	15,465	1,966	17,431	-	0	-	0	17,431
1989	18,009	1,932	19,941	-	0	452	452	20,393
1990	17,593	775	18,368	-	0	416	416	18,784
1991	7,648	214	7,862	-	0	380	380	8,242
1992	10,956	43	10,999	-	0	33	33	11,032
1993	8,777	752	9,529	-	0	218	218	9,747
1994	3,919	27	3,946	-	-	-	-	3,946
1995[b/]	2,248	272	2,520	-	-	26	26	2,546
1996[b/]	4,814	130	4,944	-	-	5	5	4,949
1997[b/]	1,771	14	1,785	-	-	8	8	1,793

TABLE C-1. Salmon catches in numbers of fish from the Cape Flattery and Strait of Juan de Fuca areas, by gear and species. (Page 2 of 4)

Area and Year	Treaty Indian			Non-Indian				Grand Total
	Troll	Net	Total	Troll	Net	Sport[a/]	Total	
CHINOOK LANDINGS								
Area 5								
1979	97	3,571	3,668	43	3,400	30,914	34,357	38,025
1980	64	5,568	5,632	0	737	20,591	21,328	26,960
1981	80	10,068	10,148	1	2,774	17,145	19,920	30,068
1982	67	13,214	13,281	9	2,566	12,538	15,113	28,394
1983	169	7,712	7,881	7	551	16,839	17,397	25,278
1984	1,404	8,504	9,908	9	399	11,993	12,401	22,309
1985	4,047	7,280	11,327	18	612	18,382	19,012	30,339
1986	15,008	9,514	24,522	0	85	36,146	36,231	60,753
1987	17,360	4,587	21,947	-	37	21,528	21,565	43,512
1988	32,660	5,416	38,076	-	51	22,645	22,696	60,772
1989	40,027	7,154	47,181	-	1	34,934	34,935	82,116
1990	28,105	4,001	32,106	-	4	37,752	37,756	69,862
1991	23,625	2,752	26,377	-	35	29,682	29,717	56,094
1992	15,005	851	15,856	-	0	24,385	24,385	40,241
1993	1,766	649	2,415	-	0	19,014	19,014	21,429
1994	1,388	5,635	7,023	-	-	487	487	7,510
1995[b/]	4,297	3,523	7,820	-	-	2,718	2,718	10,538
1996[b/]	7,087	472	7,559	-	-	4,393	4,393	11,952
1997[b/]	528	700	1,228	-	-	NA	NA	NA
Area 6C								
1979	3	63	66	0	107	49,688	49,795	49,861
1980	22	34	56	0	46	47,187	47,233	47,289
1981	1,235	171	1,406	8	74	34,207	34,289	35,695
1982	182	242	424	29	72	17,304	17,405	17,829
1983	612	507	1,119	2	13	41,221	41,236	42,355
1984	512	1,696	2,208	15	43	36,010	36,068	38,276
1985	1,557	944	2,501	11	142	25,885	26,038	28,539
1986	10,553	1,094	11,647	0	0	32,452	32,452	44,099
1987	17,539	2,057	19,596	-	6	31,216	31,222	50,818
1988	8,606	1,996	10,602	-	80	16,637	16,717	27,319
1989	12,088	827	12,915	-	1	17,098	17,099	30,014
1990	10,336	382	10,718	-	0	12,735	12,735	23,453
1991	7,222	301	7,523	-	0	9,605	9,605	17,128
1992	9,025	47	9,072	-	0	13,705	13,705	22,777
1993	1,196	0	1,196	-	0	13,202	13,202	14,398
1994	583	6	589	-	-	1,174	1,174	1,763
1995[b/]	148	3	151	-	-	3,631	3,631	3,782
1996[b/]	34	0	34	-	-	2,838	2,838	2,872
1997[b/]	29	0	29			NA	NA	NA

TABLE C-1. Salmon catches in numbers of fish from the Cape Flattery and Strait of Juan de Fuca areas, by gear and species. (Page 3 of 4)

Area and Year	Treaty Indian			Non-Indian				Grand Total
	Troll	Net	Total	Troll	Net	Sport[a/]	Total	
COHO LANDINGS								
Areas 4 and 4A								
1979	1,522	36	1,558	143,469	0	25,884	169,353	170,911
1980	19,488	243	19,731	69,133	0	25,274	94,407	114,138
1981	15,578	44	15,622	94,514	0	25,868	120,382	136,004
1982	92,171	78	92,249	84,171	0	39,521	123,692	215,941
1983	28,196	18	28,214	2,353	0	51,826	54,179	82,393
1984	30,534	0	30,534	16,441	0	6,371	22,812	53,346
1985	51,564	18	51,582	44	0	23,594	23,638	75,220
1986	33,631	160	33,791	19,026	0	21,759	40,785	74,576
1987	52,489	49	52,538	1,171	0	25,406	26,577	79,115
1988	33,546	80	33,626	2,229	-	15,809	18,038	51,664
1989	42,362	174	42,536	41,089	-	20,237	61,326	103,862
1990	43,143	0	43,143	34,285	-	25,356	59,641	102,784
1991	43,445	50	43,495	24,124	-	23,343	47,467	90,962
1992	47,416	35	47,451	7,664	-	12,990	20,654	68,105
1993	40,728	20	40,748	3,163	-	19,027	22,190	62,938
1994	-	0	0	-	-	-	-	-
1995[b/]	24,812	0	24,812	20,805	-	8,203	29,008	53,820
1996[b/]	14,991	2	14,993	17,500	-	6,634	24,134	39,127
1997[b/]	8,957	0	8,957	-	-	0	0	8,957
Area 4B								
1979	3,062	12,507	15,569	2,003	10,335	-	12,338	27,907
1980	251	1,843	2,094	1	1,810	-	1,811	3,905
1981	2,976	2,802	5,778	3	810	-	813	6,591
1982	4,179	16,768	20,947	13,776	12,257	-	26,033	46,980
1983	3,621	6,449	10,070	8	1,131	-	1,139	11,209
1984	1,454	12,775	14,229	0	25	-	25	14,254
1985	573	15,665	16,238	50	1,359	-	1,409	17,647
1986	7,047	9,903	16,950	14	721	-	735	17,685
1987	5,171	3,942	9,113	-	14	-	14	9,127
1988	4,670	265	4,935	-	3	-	3	4,938
1989	11,618	13,819	25,437	-	0	19,882	19,882	45,319
1990	25,603	5,211	30,814	-	29	20,286	20,315	51,129
1991	8,193	1,222	9,415	-	0	15,132	15,132	24,547
1992	10,253	49	10,302	-	0	11,711	11,711	22,013
1993	2,113	939	3,052	-	0	8,168	8,168	11,220
1994	-	101	101	-	-	-	-	101
1995[b/]	3,087	884	3,971	-	-	4,640	4,640	8,611
1996[b/]	1,125	19	1,144	-	-	2,327	2,327	3,471
1997[b/]	3,639	6	3,645	-	-	1,494	1,494	5,139

TABLE C-1. Salmon catches in numbers of fish from the Cape Flattery and Strait of Juan de Fuca areas, by gear and species. (Page 4 of 4)

Area and Year	Treaty Indian			Non-Indian				Grand Total
	Troll	Net	Total	Troll	Net	Sport[a/]	Total	
COHO LANDINGS								
Area 5								
1979	29	26,882	26,911	193	25,549	76,876	102,618	129,529
1980	6	36,798	36,804	0	4,190	18,746	22,936	59,740
1981	21	46,092	46,113	54	5,205	33,045	38,304	84,417
1982	1	72,400	72,401	109	9,509	54,728	64,346	136,747
1983	56	31,070	31,126	161	1,655	40,598	42,414	73,540
1984	520	32,444	32,964	36	1,251	27,270	28,557	61,521
1985	763	64,482	65,245	541	3,328	72,065	75,934	141,179
1986	4,441	60,104	64,545	18	332	102,727	103,077	167,622
1987	3,085	57,247	60,332	-	332	80,101	80,433	140,765
1988	430	18,301	18,731	-	390	85,164	85,554	104,285
1989	1,101	48,945	50,046	-	2	112,235	112,237	162,283
1990	1,663	25,542	27,205	-	306	185,118	185,424	212,629
1991	4,680	32,150	36,830	-	715	166,936	167,651	204,481
1992	1,119	5,159	6,278	-	0	84,457	84,457	90,735
1993	140	3,351	3,491	-	0	42,571	42,571	46,062
1994	0	12,821	12,821	-	-	31	31	12,852
1995[b/]	0	13,447	13,447	-	-	35,271	35,271	48,718
1996[b/]	0	1,532	1,532	-	-	29,446	29,446	30,978
1997[b/]	0	777	777	-	-	NA	NA	NA
Area 6C								
1979	0	379	379	0	521	13,730	14,251	14,630
1980	0	125	125	0	308	5,405	5,713	5,838
1981	49	688	737	27	197	19,412	19,636	20,373
1982	5	1,287	1,292	674	269	16,467	17,410	18,702
1983	112	200	312	17	69	31,167	31,253	31,565
1984	37	364	401	30	36	31,213	31,279	31,680
1985	4	585	589	82	543	16,861	17,486	18,075
1986	214	469	683	0	0	39,024	39,024	39,707
1987	656	1,288	1,944	-	19	45,614	45,633	47,577
1988	127	1,614	1,741	-	296	30,791	31,087	32,828
1989	255	1,071	1,326	-	22	33,592	33,614	34,940
1990	269	519	788	-	0	42,080	42,080	42,868
1991	326	2,380	2,706	-	1	25,081	25,082	27,788
1992	238	155	393	-	0	17,136	17,136	17,529
1993	22	16	38	-	0	13,309	13,309	13,347
1994	0	27	27	-	-	9	9	36
1995[b/]	-	24	24	-	-	6,987	6,987	7,011
1996[b/]	0	31	31	-	-	15,122	15,122	15,153
1997[b/]	0	0	0	-	-	NA	NA	NA

a/ Recreational catches for Area 4B are included in Areas 4 and 4A catches for ocean opening and represent total catches from the port of Neah Bay. Any fisheries open only in Area 4B (i.e., the late-season state-water fisheries) is reported as Area 4B catch. Recreational catches for Areas 5 and 6C represent catches for the Sekiu and eastern Strait areas (punch card Areas 5 and 6), respectively.

b/ Preliminary.

TABLE C-2. Comparative Strait of Juan de Fuca treaty Indian troll commercial chinook catches during the early part (October through January) of the winter season. (Page 1 of 1)

	Area			
Year	4B	5	6C	Total (Oct.-Jan.)
1989-1990	9,873	33,886	9,653	53,412
1990-1991	1,443	18,222	7,437	27,102
1991-1992	841	19,016	8,019	27,876
1992-1993	3,659	4,470	543	8,672
1983-1994	965	1,778	993	3,736
1994-1995	313	767	47	1,127
1995-1996	1,470	1,743	14	3,227
1996-1997[a/]	196	1,969	0	2,165
1997-1998[a/]	16	53	0	69

a/ Preliminary.

APPENDIX D
SALMON HARVEST ALLOCATION SCHEDULES

TABLE OF CONTENTS

LIST OF TABLES

ALLOCATION OF SALMON HARVEST AMONG NON-INDIAN FISHERIES NORTH OF CAPE FALCON AS ESTABLISHED BY AMENDMENTS 9 AND 10

Harvest allocations will be made from a total allowable ocean harvest which is maximized to the largest extent possible, but still consistent with treaty obligations, state fishery needs and spawning escapement requirements. The Council shall make every effort to establish seasons and gear requirements which provide troll and recreational fleets a reasonable opportunity to catch the available harvest. These may include single-species directed fisheries with landing restrictions for other species.

The goal of allocating ocean harvest north of Cape Falcon is to achieve, to the greatest degree possible, the objectives for the commercial and recreational fisheries as follows:

- Provide recreational opportunity by maximizing the duration of the fishing season while minimizing daily and area closures and restrictions on gear and daily limits.

- Maximize the value of the commercial harvest while providing fisheries of reasonable duration.

Initial commercial and recreational allocation will be determined by the schedule of percentages of total allowable harvest in Table D-1:

TABLE D-1. Initial schedule of commercial and recreational allocation north of Cape Falcon.

Coho			Chinook		
Harvest (thousands of fish)	Percentage[a/]		Harvest (thousands of fish)	Percentage[a/]	
	Troll	Recreational		Troll	Recreational
0-300	25	75	0-100	50	50
>300	60	40	>100-150	60	40
			>150	70	30

a/ The allocation must be calculated in additive steps when the harvest level exceeds the initial tier.

This allocation schedule should, on the average, allow for meeting the specific fishery allocation priorities described below. The initial allocation may be modified annually by preseason and inseason trades to better achieve (1) the commercial and recreational fishery objectives and (2) the specific fishery allocation priorities. The final preseason allocation adopted by the Council will be expressed in terms of quotas which are neither guaranteed catches nor inflexible ceilings. Only the total ocean harvest quota is a maximum allowable catch.

To provide flexibility to meet the dynamic nature of the fisheries and to assure achievement of the allocation objectives and fishery priorities, deviations from the allocation schedule will be allowed as follows:

1. Preseason species trades (chinook and coho) which vary from the allocation schedule may be made by the Council based upon the recommendation of the pertinent recreational and commercial Salmon Advisory Subpanel (SAS) representatives north of Cape Falcon. The Council will compare the socioeconomic impacts of any such recommendation to those of the standard allocation schedule before adopting the allocation which best meets fishery managment plan objectives.

2. Inseason transfers, including species trades of chinook and coho, may be permitted in either direction between recreational and commercial fishery quotas to allow for uncatchable fish in one fishery to be reallocated to the other. Fish will be deemed "uncatchable" by a respective commercial or recreational fishery only after considering all possible annual management actions to allow for their harvest which meet framework harvest management objectives, including single-species or exclusive

3. An exchange ratio of 4 coho to 1 chinook shall be considered a desirable guideline for preseason trades. Deviations from this guideline should be clearly justified. Inseason trades and transfers may vary to meet overall fishery objectives. (The exchange ratio of 4 coho to 1 chinook approximately equalizes the species trade in terms of average exvessel values of the two salmon species in the commercial fishery. It also represents an average species catch ratio in the recreational fishery.)

4. Any increase or decrease in the recreational or commercial total allowable catch (TAC), resulting from an inseason restructuring of a fishery or other inseason management action, does not require reallocation of the overall north of Cape Falcon non-Indian TAC.

5. The commercial TACs of chinook and coho derived during the preseason allocation process may be varied by major subareas (i.e., north of Leadbetter Point and south of Leadbetter Point) if there is a need to do so to decrease impacts on weak stocks. Deviations in each major subarea will generally not exceed 50% of the TAC of each species that would have been established without a geographic deviation in the distribution of the TAC. Deviation of more than 50% will be based on a conservation need to protect the weak stocks and will provide larger overall harvest for the entire fishery north of Cape Falcon than would have been possible without the deviation.

6. The recreational TACs of chinook and coho derived during the preseason allocation process will be distributed among the three major recreational subareas as described in the coho and chinook distribution sections below. Additionally, based on the recommendations of the SAS members representing the ocean sport fishery north of Cape Falcon, the Council will include criteria in its preseason salmon management recommendations to guide any inseason transfer of coho among the recreational subareas to meet recreational season duration objectives. Inseason redistributions of quotas within the recreational fishery or the distribution of allowable coho catch transfers from the commercial fishery may deviate from the preseason distribution. The Council may also establish additional subarea quotas within a major subarea to meet recreational season objectives when agreed to by representatives of the affected ports.

   Coho Distribution - The north of Cape Falcon preseason recreational TAC of coho will be distributed to provide 50% to the area north of Leadbetter Point and 50% to the area south of Leadbetter Point. In years with no Area 4B fishery, the distribution of coho north of Leadbetter Point will be divided to provide 74% to the subarea between Leadbetter Point and the Queets River (Westport) and 26% to the subarea north of the Queets River (Neah Bay/La Push). Table D-2 displays the distribution of shares north of Leadbetter Point with the 74/26% split. In years when there is an Area 4B fishery under state management, 25% of the numerical value of that fishery shall be added to the recreational TAC north of Leadbetter Point prior to applying the sharing percentages. That same value then would be subtracted from the Neah Bay/La Push share in order to maintain the same total distribution north of Leadbetter Point. Table D-3 displays the allowable catch shares for Westport and Neah Bay/La Push with a 20,000 coho harvest for Area 4B.

   Chinook Distribution - Subarea distributions of chinook will be managed as guidelines and shall be calculated by the STT with the primary objective of achieving all-species fisheries without imposing chinook restrictions (i.e., area closures or bag limit reductions).

   Chinook in excess of all-species fisheries needs may be utilized by directed chinook fisheries north of Cape Falcon or by negotiating a chinook/coho trade with another fishery participant group.

   Inseason management actions may be taken by the National Marine Fisheries Service regional director to assure that the primary objective of the chinook harvest guidelines for each of the three recreational subareas north of Cape Falcon are met. Such actions might include: closure from 0 to 3, 0 to 6, 3 to 200, or 5 to 200 nautical miles from shore; closure from a point extending due west from Tatoosh Island for 5 miles, then south to a point due west of Umatilla Reef Buoy, then due east to shore; closure from North Head at the Columbia River mouth north to Leadbetter Point; change in species which may be landed; or other actions as prescribed in the annual regulations.

TABLE D-2. Example distribution of the recreational coho TAC north of Leadbetter Point for years in which there is no Area 4B recreational fishery.

Recreational Coho TAC North of Cape Falcon	Allowable Coho Catch		
	North of Leadbetter Point	Westport (74%)	Neah Bay/La Push (26%)
100,000	50,000	37,000	13,000
125,000	62,500	46,250	16,250
150,000	75,000	55,500	19,500
175,000	87,500	64,750	22,750
200,000	100,000	74,000	26,000
225,000	112,500	83,250	29,250
250,000	125,000	92,500	32,500
300,000	150,000	111,000	39,000

TABLE D-3. Example distribution of the recreational coho TAC north of Leadbetter Point for years in which there is an Area 4B recreational fishery of 20,000 coho.

Recreational Coho TAC North of Cape Falcon	Allowable Coho Catch		
	North of Leadbetter Point	Westport	Neah Bay/La Push
100,000	50,000	40,700	9,300
125,000	62,500	49,950	12,550
150,000	75,000	59,200	15,800
175,000	87,500	68,450	19,050
200,000	100,000	77,700	22,300
225,000	112,500	86,950	25,550
250,000	125,000	96,200	28,800
300,000	150,000	114,700	35,300

Fishery Allocation Priorities

The priorities listed below will be used to help guide establishment of the final harvest allocation while meeting the overall commercial and recreational fishery objectives.

At total allowable harvest levels up to 300,000 coho and 100,000 chinook:

- Provide coho to the recreational fishery for a late June through early September all-species season. Provide chinook to allow (1) access to coho and, if possible, (2) a minimal chinook-only fishery prior to the all-species season. Adjust days per week and/or institute area restrictions to stabilize season duration.

- Provide chinook to the commercial troll fishery for a May and early June chinook season and provide coho to (1) meet coho hooking mortality in June where needed and (2) access a pink salmon fishery in odd years. Attempt to ensure that part of the chinook season will occur after June 1.

At total allowable harvest levels above 300,000 coho and above 100,000 chinook:

- Relax any restrictions in the recreational all-species fishery and/or extend the all-species season beyond Labor Day as coho quota allows. Provide chinook to the recreational fishery for a Memorial Day through late June chinook-only fishery. Adjust days per week to ensure continuity with the all-species season.

- Provide coho for an all-salmon commercial troll season in late summer and/or access to a pink fishery. Leave adequate chinook from the May through June season to allow access to coho.

ALLOCATION OF COHO SALMON HARVEST SOUTH OF CAPE FALCON AS ESTABLISHED BY AMENDMENTS 7, 10, AND 11

The allocation of allowable ocean harvest of coho salmon south of Cape Falcon has been developed to provide a more stable recreational season and increased economic benefits of the ocean salmon fisheries at varying stock abundance levels. When coupled with various recreational harvest reduction measures or the timely transfer of unused recreational allocation to the commercial fishery, the allocation schedule is designed to help secure recreational seasons extending at least from Memorial Day through Labor Day, assist in maintaining commercial markets even at relatively low stock sizes, and fully utilize available harvest. Total ocean catch of coho south of Cape Falcon will be treated as a quota to be allocated between troll and recreational fisheries as provided in Table D-4.

(Note: The allocation schedule provides guidance only when coho abundance permits a directed coho harvest, not when the allowable impacts are insufficient to allow coho retention south of Cape Falcon. At such low levels, allocation of the allowable impacts will be accomplished during the Council's preseason process.)

The allocation schedule is designed to give sufficient coho to the recreational fishery to increase the probability of attaining no less than a Memorial Day to Labor Day season as stock sizes increase. This increased allocation means that, in many years, actual catch in the recreational fishery may fall short of its allowance. In such situations, managers will make an inseason reallocation of unneeded recreational coho to the south of Cape Falcon troll fishery. The reallocation should be structured and timed to allow the commercial fishery sufficient opportunity to harvest any available reallocation prior to September 1, while still assuring completion of the scheduled recreational season (usually near mid-September) and, in any event, the continuation of a recreational fishery through Labor Day. This reallocation process will occur no later than August 15 and will involve projecting the recreational fishery needs for the remainder of the summer season. The remaining projected recreational catch needed to extend the season to its scheduled closing date will be a harvest guideline rather than a quota. If the guideline is met prior to Labor Day, the season may be allowed to continue if further fishing is not expected to result in any significant danger of impacting the allocation of another fishery or of failing to meet an escapement goal.

The allocation schedule is also designed to assure there are sufficient coho allocated to the troll fishery at low stock levels to ensure a full chinook troll fishery. This hooking mortality allowance will have first priority within the troll allocation. If the troll allocation is insufficient for this purpose, the remaining number of coho needed for the estimated incidental coho mortality will be deducted from the recreational share. At higher stock sizes, directed coho harvest will be allocated to the troll fishery after hooking mortality needs for chinook troll fishing have been satisfied.

The allowable harvest south of Cape Falcon may be further partitioned into subareas to meet management objectives of the FMP. Allowable harvests for subareas south of Cape Falcon will be determined by an annual blend of management considerations including:

1. abundance of contributing stocks
2. allocation considerations of concern to the Council
3. relative abundance in the fishery between chinook and coho
4. escapement goals
5. maximizing harvest potential

TABLE D-4. Allocation of allowable ocean harvest of coho salmon (thousands of fish) south of Cape Falcon.[a/]

Total Allowable Ocean Harvest	Recreational Allocation		Commercial Allocation	
	Number	Percentage	Number	Percentage
≤100	≤100[b/c/]	100[b/]	b/	b/
200	167[b/c/]	84[b/]	33[b/]	17[b/]
300	200	67	100	33
350	217	62	133	38
400	224	56	176	44
500	238	48	262	52
600	252	42	348	58
700	266	38	434	62
800	280	35	520	65
900	290	32	610	68
1,000	300	30	700	70
1,100	310	28	790	72
1,200	320	27	880	73
1,300	330	25	970	75
1,400	340	24	1,060	76
1,500	350	23	1,150	77
1,600	360	23	1,240	78
1,700	370	22	1,330	78
1,800	380	21	1,420	79
1,900	390	21	1,510	79
2,000	400	20	1,600	80
2,500	450	18	2,050	82
3,000	500	17	2,500	83

a/ The allocation schedule is based on the following formula: first 150,000 coho to the recreational base (this amount may be reduced as provided in footnote b); over 150,000 to 350,000 fish, share at 2:1, 0.667 to troll and 0.333 to recreational; over 350,000 to 800,000 the recreational share is 217,000 plus 14% of the available fish over 350,000; above 800,000 the recreational share is 280,000 plus 10% of the available fish over 800,000.

b/ If the commercial allocation is insufficient to meet the projected hook-and-release mortality associated with the commercial all-salmon-except-coho season, the recreational allocation will be reduced by the number needed to eliminate the deficit.

c/ When the recreational allocation is 167,000 coho or less, special allocation provisions apply to the recreational harvest distribution by geographic area; see text of FMP as modified by Amendment 11 allocation provisions.

Troll coho quotas may be developed for subareas south of Cape Falcon consistent with the above criteria. California recreational catches of coho, including projections of the total catch to the end of the season, would be included in the recreational allocation south of Cape Falcon, but the area south of the Oregon-California border would not close when the allocation is met; except as provided below when the recreational allocation is at 167,000 or fewer fish.

When the south of Cape Falcon recreational allocation is equal to or less than 167,000 coho:

1. The recreational fisheries will be divided into two major subareas, as listed in #2 below, with independent quotas (i.e., if one quota is not achieved or is exceeded, the underage or overage will not be added to or deducted from the other quota; except as provided under #3 below).

2. The two major recreational subareas will be managed within the constraints of the following impact quotas, expressed as a percentage of the total recreational allocation (percentages based on avoiding large deviations from the historical harvest shares):

   a. Central Oregon (Cape Falcon to Humbug Mountain) - 70%

   b. South of Humbug Mountain - 30%

      In addition,

      (1) Horse Mountain to Point Arena will be managed for an impact guideline of 3 percent of the south of Cape Falcon recreational allocation, and

      (2) there will be no coho harvest constraints south of Point Arena. However, the projected harvest in this area (which averaged 1,800 coho from 1986-1990) will be included in the south of Humbug Mountain impact quota.

3. Coho quota transfers can occur on a one-for-one basis between subareas if chinook constraints preclude access to coho.