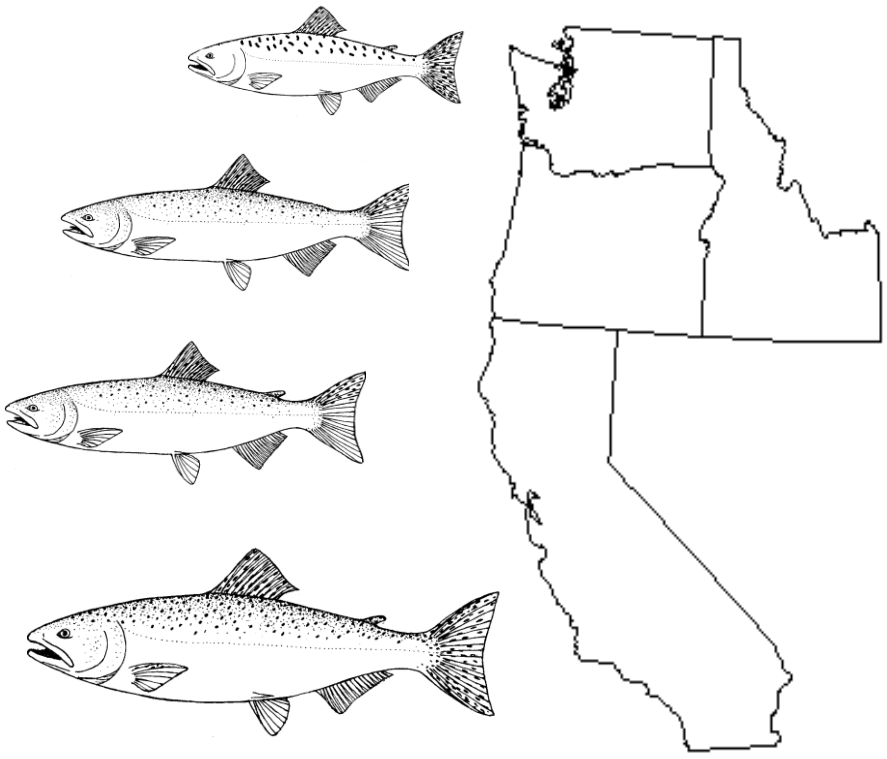
PRESEASON REPORT I

STOCK ABUNDANCE ANALYSIS
AND
ENVIRONMENTAL ASSESSMENT PART 1
FOR 2019 OCEAN SALMON FISHERY REGULATIONS

REGULATION IDENTIFIER NUMBER 0648-BI05



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LIST OF ACRONYMS AND ABBREVIATIONS

ABC	acceptable biological catch
ACL	annual catch limit
BY	brood year
CDFW	California Department of Fish and Wildlife
CoTC	Coho Technical Committee (of the PSC)
Council	Pacific Fishery Management Council
CRFMP	Columbia River Fishery Management Plan
CWT	coded-wire tag
EA	Environmental Assessment
EEZ	exclusive economic zone (from 3-200 miles from shore)
EIS	Environmental Impact Statement
EMAP	Environmental Monitoring and Assessment Program
ESA	Endangered Species Act
ESU	evolutionarily significant unit
F_{ABC}	exploitation rate associated with ABC
F_{ACL}	exploitation rate associated with ACL (= F_{ABC})
FMP	fishery management plan
F_{MSY}	maximum sustainable yield exploitation rate
FNMC	Far-North-Migrating Coastal
F_{OFL}	exploitation rate associated with the overfishing limit (= F_{MSY}, MFMT)
FONSI	Finding of No Significant Impacts
FRAM	Fishery Regulatory Assessment Model
GAM	generalized additive models
ISBM	individual stock-based management
Jack CR	Columbia River jacks (coho)
Jack OC	Oregon coastal and Klamath River Basin jacks (coho)
Jack OPI	Jack CR + Jack OC (coho)
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
KRFC	Klamath River fall Chinook
KRTT	Klamath River Technical Team
LCN	lower Columbia River natural (coho)
LCR	lower Columbia River (natural tule Chinook)
LRB	lower Columbia River bright (Chinook)
LRH	lower Columbia River hatchery (tule fall Chinook returning to hatcheries below Bonneville Dam)
LRW	lower Columbia River wild (bright fall Chinook spawning naturally in tributaries below Bonneville Dam)
MCB	Mid-Columbia River bright (bright hatchery fall Chinook released below McNary Dam)
MFMT	maximum fishing mortality threshold
MOC	mid-Oregon coast
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSM	mixed stock model
MSST	minimum stock size threshold
MSY	maximum sustainable yield
NA	not available
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOC	north Oregon coast

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

NPGO	North Pacific Gyre Oscillation
NS1G	National Standard 1 Guidelines
OCN	Oregon coast natural (coho)
OCNL	Oregon coast natural lake (coho)
OCNR	Oregon coast natural river (coho)
ODFW	Oregon Department of Fish and Wildlife
OFL	overfishing limit
OPI	Oregon Production Index (coho salmon stock index south of Leadbetter Point)
OPIH	Oregon Production Index public hatchery
OPITT	Oregon Production Index Technical Team
OY	Optimum Yield
PDO	Pacific Decadal Oscillation
PFMC	Pacific Fishery Management Council (Council)
PRIH	Private hatchery
PSC	Pacific Salmon Commission
PST	Pacific Salmon Treaty
RER	rebuilding exploitation rate
RK	Rogue/Klamath (coho)
RMP	Resource Management Plan (for exemption from ESA section 9 take prohibitions under limit 6 of the 4(d) rule)
ROPI	Rogue Ocean Production Index (Chinook)
SAB	Select Area brights (bright fall Chinook destined for Select Area sites on the lower Columbia River)
S_{ABC}	spawning escapement associated with ABC
S_{ACL}	spawning escapement associated with ACL (= S_{ABC})
SCH	Spring Creek Hatchery (tule fall Chinook returning to SCH)
SHM	Sacramento Harvest Model
SI	Sacramento Index
SJF	Strait of Juan de Fuca
S_{MSY}	MSY spawning escapement
S_{OFL}	spawning escapement associated with the overfishing limit (= S_{MSY})
SOC	south Oregon Coast
SRFC	Sacramento River fall Chinook
SRS	Stratified Random Sampling
SRWC	Sacramento River winter Chinook
STEP	Salmon Trout Enhancement Program
STT	Salmon Technical Team (formerly the Salmon Plan Development Team)
TAC	Technical Advisory Committee (*U.S. v. Oregon*)
URB	Upriver bright (naturally spawning bright fall Chinook primarily migrating past McNary Dam)
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 ocean fishery salmon management off the coasts of Washington, Oregon, and California. The report focuses on Chinook, coho, and pink salmon stocks that have been important in determining Council fisheries in recent years, and on stocks listed under the Endangered Species Act (ESA) with established National Marine Fisheries Service (NMFS) ESA consultation standards. This report will be formally reviewed at the Council's March 2019 meeting.

This report provides 2019 salmon stock abundance forecasts, and an analysis of the impacts of 2018 management measures or regulatory procedures, on the projected 2019 abundance. This analysis is intended to give perspective in developing 2019 management measures. This report also constitutes the first part of an Environmental Assessment (EA) to comply with National Environmental Policy Act (NEPA) requirements for the 2019 ocean salmon management measures. An EA is used to determine whether an action being considered by a Federal agency has significant impacts. This part of the EA includes a statement of the purpose and need, a summary description of the affected environment, a description of the No-Action Alternative, and an analysis of the No-Action Alternative effects on the salmon stocks included in the Council's Salmon Fishery Management Plan (FMP).

The STT and Council staff will provide two additional reports prior to the beginning of the ocean salmon season to help guide the Council's selection of annual fishery management measures: Preseason Report II and Preseason Report III. These reports will analyze the impacts of the Council's proposed alternatives and adopted fishery management recommendations, respectively. Preseason Report II will constitute the second part of the EA, and will include additional description of the affected environment relevant to the alternative management measures considered for 2019 ocean salmon fisheries, a description of the alternatives, and an analysis of the environmental consequences of the alternatives. Preseason Report II will also analyze the potential impacts of a reasonable range of alternatives, which will inform the final fishery management measures included in Preseason Report III. Preseason Report III will describe and analyze the effects of the Council's final proposed action, including cumulative effects. Together, these parts of the EA will provide the necessary components to determine if a finding of no significant impact (FONSI) or Environmental Impact Statement (EIS) is warranted.

Chapter I provides a summary of stock abundance forecasts. Chapters II and III provide detailed stock-by-stock analyses of abundance, a description of prediction methodologies, and accuracy of past abundance forecasts for Chinook and coho salmon, respectively. Chapter IV summarizes abundance and forecast information for pink salmon. Chapter V provides an assessment of 2018 regulations applied to 2019 abundance forecasts. Appendices provide supplementary information as follows: Appendix A provides a summary of Council stocks and their management objectives; Appendix B contains the Council's current harvest allocation schedules, and Appendix C contains pertinent data for Oregon Production Index (OPI) area coho. Appendix D summarizes the change in Sacramento River Winter Chinook management that was implemented beginning in 2018. For NEPA purposes, Chapters I-IV of this document describe the affected environment and Chapter V provides a description and analysis of the No-Action Alternative.

Purpose and Needs

The purpose of this action, implementation of the 2019 ocean salmon fishery management measures, is to allow fisheries to harvest surplus production of healthy natural and hatchery salmon stocks within the constraints specified under the Salmon FMP, the Pacific Salmon Treaty (PST), and consultation standards established for ESA-listed salmon stocks. In achieving this purpose, management measures must take into account the allocation of harvest among different user groups and port areas. Without this action, 2018

management measures would be in effect, which do not consider changes in abundance of stocks in the mixed stock ocean salmon fisheries. Therefore, this action is needed to ensure constraining stocks are not overharvested, and that harvest of abundant stocks can be optimized and achieve the most overall benefit to the nation.

The Salmon FMP also establishes nine more general harvest-related objectives:

1. Establish ocean exploitation rates for commercial and recreational salmon fisheries that are consistent with requirements for stock conservation objectives and annual catch limits (ACLs), specified ESA consultation standards, or Council-adopted rebuilding plans.

2. Fulfill obligations to provide opportunity for Indian harvest of salmon as provided in treaties with the United States, as mandated by applicable decisions of the Federal courts, and as specified in the October 4, 1993 opinion of the Solicitor, Department of Interior, with regard to federally-recognized Indian fishing rights of Klamath River Tribes.

3. Maintain ocean salmon fishing seasons supporting the continuance of established recreational and commercial fisheries, while meeting salmon harvest allocation objectives among ocean and inside recreational and commercial fisheries that are fair and equitable, and in which fishing interests shall equitably share the obligations of fulfilling any treaty or other legal requirements for harvest opportunities.

4. Minimize fishery mortalities for those fish not landed from all ocean salmon fisheries as consistent with achieving optimum yield (OY) and bycatch management specifications.

5. Manage and regulate fisheries so that the OY encompasses the quantity and value of food produced, the recreational value, and the social and economic values of the fisheries.

6. Develop fair and creative approaches to managing fishing effort, and evaluate and apply effort management systems as appropriate to achieve these management objectives.

7. Support the enhancement of salmon stock abundance in conjunction with fishing effort management programs to facilitate economically viable and socially acceptable commercial, recreational, and tribal seasons.

8. Achieve long-term coordination with the member states of the Council, Indian tribes with federally-recognized fishing rights, Canada, the North Pacific Fishery Management Council, Alaska, and other management entities which are responsible for salmon habitat or production. Manage consistent with the PST and other international treaty obligations.

9. In recommending seasons, to the extent practicable, promote the safety of human life at sea.

These objectives, along with the consultation standards established under the ESA, provide "sideboards" for setting management measures necessary to implement the Salmon FMP, which conforms to the terms and requirements of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and the National Standard 1 Guidelines (NS1G).

Implementation of 2019 management measures will allow fisheries to harvest surplus production of healthy natural and hatchery salmon stocks within the constraints specified under the Salmon FMP and consultation standards established for ESA-listed salmon stocks.

The reauthorization of the MSA in 2006 established new requirements to end and prevent overfishing through specification of overfishing limits (OFL), acceptable biological catch (ABC), ACLs and accountability measures (AMs). Because OFLs, ABCs, and ACLs are based on annual abundance forecasts, Preseason Report I also specifies OFLs, ABCs, and ACLs for 2019 fisheries.

CHAPTER I: DESCRIPTION OF THE AFFECTED ENVIRONMENT

The action area for this proposed action is the exclusive economic zone (EEZ), 3 to 200 nautical miles, off the West Coast of the U.S. (California, Oregon, and Washington).

The affected environment relevant to establishing the 2019 ocean salmon fishery management measures consists of the following components:

- Target Species – Chinook, coho, and pink salmon,
- ESA-listed salmon stocks; and
- Socioeconomic aspects of coastal communities, federally-recognized Tribes, and states.

A description of the historical baseline for these components of the affected environment is presented in the Review of 2018 Ocean Salmon Fisheries (PFMC 2019). The current status (2019 ocean abundance forecasts) of the environmental components expected to be affected by the 2019 ocean salmon fisheries regulation alternatives (FMP salmon stocks, including those listed under the ESA) are described in this report (Part 1 of the 2019 salmon EA); the Review of 2018 Ocean Salmon Fisheries (PFMC 2019) provides an historical description of the salmon fishery-affected environment, including stock status and socioeconomic impacts, and represents the current status of the socioeconomic component of the affected environment.

The No-Action alternative was assessed in the 2018 NEPA process for ocean salmon regulations (Preseason Reports II and III; PFMC 2018b and 2018c). In those analyses, proposed management measures were determined to have no significant impacts on several components of the affected environment. These components included:

- Non-target species – Pacific Halibut, groundfish (NMFS 2003; PFMC 2006, 2018a)
- Marine mammals – pinnipeds, killer whales (NMFS 2003, 2008; PFMC 2006, 2018a)
- Seabirds (NMFS 2003; PFMC 2006, 2018a)
- Ocean and coastal habitats, ESA critical habitat, and Essential Fish Habitat (EFH) (NMFS 2003; PFMC 2006, 2018a)
- Biodiversity and ecosystem function (NMFS 2003; PFMC 2006, 2018a)
- Unique characteristics of the geographic area (NMFS 2003; PFMC 2006, 2018a)
- Cultural, scientific, or historical resources such as those eligible for listing in the National Register of Historic Places (NMFS 2003; PFMC 2006, 2018a)
- Public health or safety (NMFS 2003; PFMC 2006, 2018a)

The 2019 No-Action alternative is the same as the 2018 action, therefore it is expected to have no significant impacts on these elements of the environment. Thus, this document includes analysis of the impacts of the No Action alternative on salmon stocks identified in the FMP, the component of the environment for which conditions have changed such that the effects in 2019 are different.

The component of the affected environment that is described in this document consists only of the salmon stocks identified in the FMP (Appendix A). The 2019 forecast abundance of the FMP salmon stocks represents this component of the affected environment. The surviving stock after fishery-related mortality is generally referred to as spawning escapement (S), and the proportion of the stock that succumbs to fishing-related mortality is generally referred to as the exploitation rate (F); these are the metrics that constitute conservation objectives for FMP stocks, and by which effects of the alternatives to this part of the affected environment are evaluated. Thus, application of management measures (alternatives) to the abundance forecasts (affected environment) results in projected exploitation rates and spawning escapements (effects).

A description of the other components of the affected environment considered for 2019 ocean salmon fishery regulation alternatives, including socioeconomic components and updated additional information on the biological components of the environment, will be presented in Preseason Report II, to be issued after the March Council meeting.

ABUNDANCE FORECASTS

Abundance forecasts in 2019 are summarized for key Chinook and coho salmon stocks in Tables I-1 and I-2, respectively. A cursory comparison of preseason forecast and postseason abundance estimates for selected stocks is presented in Figures II-2, 3, 4 and III-1. More detailed analyses of this subject are covered in Chapters II (Chinook) and III (coho). Information on pink salmon abundance and forecasts is contained in Chapter IV. Council Salmon FMP conservation objectives are presented in Appendix A; allocation objectives are presented in Appendix B.

In addition to the key stocks with abundance forecasts listed in Tables I-1 and I-2, Council management decisions for the 2019 ocean salmon fishing seasons may be constrained by other stocks, such as those listed under the ESA or subject to PSC agreements, which may not have abundance forecasts made, or do not have abundance forecasts available in time for inclusion in this report. These include the following Evolutionarily Significant Units (ESUs): Central Valley Spring Chinook, California Coastal Chinook, Lower Columbia River (LCR) natural tule Chinook, Snake River Fall Chinook; Central California Coast coho, Southern Oregon/Northern California Coast coho, and Interior Fraser (including Thompson River) coho.

ACCEPTABLE BIOLOGICAL CATCH, ANNUAL CATCH LIMITS, AND OVERFISHING LIMITS

Amendment 16 to the Salmon FMP, approved in December 2011, was developed to comply with the requirements of the 2006 MSA reauthorization, including specification of acceptable biological catch (ABC), annual catch limits (ACLs), overfishing limits (OFLs), and Scientific and Statistical Committee (SSC) recommendations for ABC. Amendment 16 established that ABC and ACLs were required for two stocks, Sacramento River fall Chinook (SRFC) and Klamath River fall Chinook (KRFC), which serve as indicator stocks for the Central Valley Fall and Southern Oregon/Northern California Chinook complexes, respectively. Other stocks in the FMP are not required to have ACLs either because they were components of these two stock complexes, were ESA-listed, were hatchery stocks, or were managed under an international agreement. Since publication of Amendment 16, ABC and ACL specifications have been added to the Salmon FMP for Willapa Bay natural coho.

ABCs and ACLs are not specified for stocks that are managed under an international agreement as there is a statutory exception in the MSA to the requirement for ACLs, and the NS1Gs state that ABCs are not required if stocks meet this international exception. The NS1Gs allow the flexibility to consider alternative approaches for specifying ACLs for stocks with unusual life history characteristics like Pacific salmon, and particularly for species listed under the ESA and hatchery stocks. For hatchery stocks, broodstock goals serve as conservation objectives rather than specifying ACLs. For ESA-listed stocks, biological opinions and associated consultation standards describe necessary controls to ensure their long-term conservation.

Preseason OFLs are determined for all non-ESA-listed and non-hatchery stocks with an estimate of F_{MSY} (or Maximum Fishing Mortality Threshold, MFMT) and sufficient information available to make abundance forecasts.

Acceptable Biological Catch

For salmon, ABC is defined in terms of spawner escapement (S_{ABC}), which is determined annually based on stock abundance, in spawner equivalent units (N) and the exploitation rate F_{ABC}.

$S_{ABC}=N \times (1 - F_{ABC})$

The ABC control rule defines F_{ABC} as a fixed exploitation rate reduced from F_{MSY} to account for scientific uncertainty. The degree of the reduction in F between F_{ABC} and F_{MSY} depends on whether F_{MSY} is directly estimated (tier 1 stock) or a proxy value is used (tier 2 stock). For tier 1 stocks, F_{ABC} equals F_{MSY} reduced by five percent. For tier 2 stocks, F_{ABC} equals F_{MSY} reduced by ten percent.

Tier-1: $F_{ABC} = F_{MSY} \times 0.95$.
Tier-2: $F_{ABC} = F_{MSY} \times 0.90$.

Annual Catch Limit

ACLs are also defined in terms of spawner escapement (S_{ACL}) based on N and the corresponding exploitation rate (F_{ACL}), where the exploitation rate is a fixed value that does not change on an annual basis.

F_{ACL} is equivalent to F_{ABC} and

$S_{ACL} = N \times (1-F_{ACL})$,

which results in $S_{ACL} = S_{ABC}$ for each management year.

During the annual preseason salmon management process, S_{ACL} is estimated using the fixed F_{ACL} exploitation rate and the preseason forecast of N. Thus, fishery management measures must result in an expected spawning escapement greater than or equal to this preseason estimate of S_{ACL}.

Overfishing Limit

For salmon, OFL is defined in terms of spawner escapement (S_{OFL}), which is consistent with the common practice of using spawner escapement to assess stock status for salmon. S_{OFL} is determined annually based on stock abundance, in spawner equivalent units (N) and the exploitation rate F_{OFL}.

F_{OFL} is defined as being equal to F_{MSY} (or MFMT) and

$S_{OFL} = N \times (1 - F_{MSY})$.

STATUS DETERMINATION CRITERIA

Amendment 16 also included new status determination criteria (SDC) for overfishing, approaching an overfished condition, overfished, not overfished/rebuilding, and rebuilt. These criteria are:

- Overfishing occurs when a single year exploitation rate exceeds the maximum fishing mortality threshold (MFMT), which is based on the maximum sustainable yield exploitation rate (F_{MSY});
- Approaching an overfished condition occurs when the geometric mean of the two most recent postseason estimates of spawning escapement, and the current preseason forecast of spawning escapement, is less than the minimum stock size threshold (MSST);
- Overfished status occurs when the most recent 3-year geometric mean spawning escapement is less than the MSST;
- Not overfished/rebuilding status occurs when a stock has been classified as overfished and has not yet been rebuilt, and the most recent 3-year geometric mean spawning escapement is greater than the MSST but less than S_{MSY};
- A stock is rebuilt when the most recent 3-year geometric mean spawning escapement exceeds S_{MSY}.

Comparison of stock status to criteria for overfishing, overfished, not overfished/rebuilding, and rebuilt were reported in the annual SAFE document, Review of 2018 Ocean Salmon Fisheries (PFMC 2019).

Approaching an overfished condition relies on current year preseason forecasts and Council adopted fishing regulations for the upcoming season in order to calculate projected spawning escapement. In this report, because the actual regulations for the upcoming season are not yet known, the calculations are based on preseason forecasts and Council-adopted regulations from the year prior. Thus, the stock status in this report is described as being *at risk* of approaching an overfished condition. Once the regulations for the upcoming season are adopted and spawning escapement is projected, the status description will be updated and provided in the Preseason-III report. All SDC rely on the most recent estimates available, which in some cases may be a year or more in the past because of incomplete broods or data availability; however, some status descriptions reported in the SAFE document may be updated if more recent spawning escapement or exploitation rate estimates become available between the time the SAFE document and this document are published.

TABLE I-1. Preseason adult Chinook salmon stock forecasts in thousands of fish. (Page 1 of 3)

Production Source and Stock or Stock Group	Preseason Abundance Forecasts 2014	2015	2016	2017	2018	2019	Methodology for 2019 Prediction and Source
Sacramento River							
Fall (Sacramento Index)	634.7	652.0	299.6	230.7	229.4	379.6	Log-log regression of the Sacramento Index on jack escapement from the previous year, accounting for lag-1 autocorrelated errors. STT.
Winter (age-3 absent fishing)	--	--	--	--	1.6	1.9	Stochastic life cycle model applied to natural- and hatchery-origin production. STT.
Klamath River (Ocean Abundance)							
Fall	299.3	423.8	142.2	54.2	359.2	274.2	Linear regression analysis of age-specific ocean abundance estimates on river runs of same cohort. STT.
Oregon Coast							
North and South/Local Migrating	--	--	--	--	--	--	None.
Columbia River (Ocean Escapement)							
Upriver Spring [a/]	227.0	232.5	188.8	160.4	166.7	99.3	Log-linear sibling regressions of cohort returns in previous run years. Columbia River TAC.
Willamette Spring	58.7	55.4	68.7	38.1	53.8	40.2	Age-specific linear regressions of cohort returns in previous run years. ODFW. Forecast includes adult fish only.
Sandy Spring	5.5	5.5	NA	3.6	5.3	5.5	Recent 3-year average. ODFW.
Cow litz Spring	7.8	11.2	25.1	17.1	5.2	1.3	Age-specific linear regressions of cohort returns in previous run years. WDFW.
Kalama Spring	0.5	1.9	4.9	3.1	1.5	1.4	Age-specific linear regressions of cohort returns in previous run years. WDFW.
Lew is Spring	1.1	1.1	1.0	0.7	3.7	1.5	Age-specific linear regressions of cohort returns in previous run years. WDFW.
Upriver Summer [b/]	67.5	73.0	93.3	63.1	67.3	35.9	Log-linear sibling regressions or average return (4-ocean fish). Columbia River TAC subgroup.
URB Fall	973.3	500.3	589.0	260.0	200.1	158.4	Columbia River Fall Chinook: Age-specific average cohort ratios or
SCH Fall	115.1	160.5	89.6	158.4	50.1	46.0	sibling regressions. Columbia River TAC subgroup and WDFW.
LRW Fall	34.2	18.9	22.2	12.5	7.6	13.7	
LRH Fall	110.0	94.9	133.7	92.4	62.4	54.5	
MCB Fall	360.1	113.3	101.0	45.6	36.4	56.7	

TABLE I-1. Preseason adult Chinook salmon stock forecasts in thousands of fish. (Page 2 of 3)

Production Source and Stock or Stock Group		Preseason Abundance Forecasts 2014	2015	2016	2017	2018	2019	Methodology for 2019 Prediction and Source
Washington Coast								
Willapa Bay Fall	Natural	2.9	3.8	3.3	4.2	3.8	4.3	Return per spawners applied to 3-6 year olds (brood years 2013-16)
	Hatchery	29.5	31.0	36.2	34.3	40.3	23.8	adjusted by brood year performance.
Grays Harbor Fall	Natural	--	--	--	--	16.4	NA	Past year based on a 4-year average recruits for age-3, and recruits per spawner adjusted by brood performance for age-4, 5, 6.
	Hatchery	--	--	--	--	4.8	NA	Past year based on a 10-year average recruits per spawn for age 3 and log linear regressions for age-4 on Age-2 and 3; age-5 on age-2, 3, and 4 for all stocks; and age- 6 on age-5.
Quinault Spring/Summer	Natural	NA	NA	NA	NA	NA	NA	Hatchery: Past year based on ten-year average recruits per
	Hatchery	--	--	--	--	4.8	NA	spawner for age-3; log linear regressions for age-4 on age-2 and 3; age-5 on age-2, 3, 4 for all stocks; and age-6 on age-5.
Quinault Fall	Natural	6.0	8.1	5.5	5.9	5.2	NA	
	Hatchery	10.3	4.0	5.3	4.4	3.1	NA	
Queets Spring/Sum	Natural	0.5	0.4	0.5	0.5	0.5	0.6	Based on recent 5 year average.
Queets Fall	Natural	3.6	4.3	4.9	3.7	3.3	NA	Past year based on recent year mean and cohort relationship.
	Hatchery	0.9	1.5	1.7	0.9	0.6	NA	Past year based on returns per smolt release.
Hoh Spring/Summer	Natural	0.9	0.8	0.9	1.0	1.1	1.0	Recent 3 year mean adjusted by previous performance.
Hoh Fall	Natural	2.5	2.6	1.8	2.7	2.6	2.5	Recent 5 year mean adjusted by previous performance, age 3 & 4 adjusted by regressions.
Quillayute Spring	Hatchery	2.0	1.7	1.8	2.2	2.1	2.1	Spring: Recent 5 year mean adjusted by previous performance.
Quillayute Sum/Fall	Natural	7.6	8.5	7.5	7.6	8.0	7.9	Summer: Recent 3 year mean for all ages. Fall: Recent 5 year means; adjusted for previous 5 year forecast performance.
Hoko[c/]	Natural	2.7	3.3	2.9	1.5	1.5	2.8	Includes supplemental. 2018 recruits for age-3 is recent 5-year average return, age 4-6 is sibling regression.
North Coast Totals								
Spring/Summer	*Natural*	*1.4*	*1.2*	*1.4*	*1.5*	*1.6*	*1.7*	
Fall	*Natural*	*19.7*	*23.5*	*19.7*	*19.9*	*19.1*	*NA*	
Spring/Summer	*Hatchery*	*2.0*	*1.7*	*1.8*	*2.2*	*2.1*	*2.1*	
Fall	*Hatchery*	*11.2*	*5.5*	*7.0*	*5.3*	*3.7*	*NA*	

TABLE I-1. Preseason adult Chinook salmon stock forecasts in thousands of fish. (Page 3 of 3)

Production Source and Stock or Stock Group		Preseason Abundance Forecasts 2014	2015	2016	2017	2018	2019	Methodology for 2019 Prediction and Source
Puget Sound summer/fall[d/]								
Nooksack/Samish	Hatchery	43.9	38.6	27.9	21.2	24.6	21.3	Three year average return rate.
East Sound Bay	Hatchery	1.2	1.2	0.7	0.8	0.7	0.3	Three year average return rate.
Skagit[e/]	Natural	18.0	11.8	15.1	15.8	13.3	13.6	Natural: Hierarchical Bayesian model to estimate the spawner-recruit dynamics. Hatchery: Recent 4-year average terminal smolt to adult return rate to estimate ages 2 -5.
	Hatchery	0.3	0.6	0.4	0.4	0.3	0.3	
Stillaguamish[f/]	Natural	1.6	0.5	0.5	1.5	1.6	0.9	Natural plus Hatchery. Multiple regression environmental model (EMPAR).
Snohomish[f/]	Natural	5.3	4.2	3.3	3.4	3.5	3.7	Escapement without fishing. Multiple regression environmental model (EMPAR).
	Hatchery	5.4	3.3	5.0	4.8	6.5	7.2	Terminal Run (to 8-2), with ocean fishing, Recent 4-year geomean age at return rates applied to releases.
Tulalip[f/]	Hatchery	4.7	1.3	1.4	5.3	7.5	12.7	Three year geomean escapement without fishing.
South Puget Sound	Natural	4.8	3.8	4.5	4.7	4.8	8.4	Natural: Puyallup R. average return per spawner applied to brood years contributing ages 3-5. For Nisqually, 5 year average age specific return/spawner. For Green, 3-year geometric return rates. Hatchery: Variety of recent year average return rates and sibling relationships.
	Hatchery	96.7	62.4	43.1	80.4	123.6	99.9	
Hood Canal[e/]	Natural	3.5	3.1	2.3	2.5	3.9	1.2	Natural fish based on the Hood Canal terminal run reconstruction-based relative contribution of the individual Hood Canal management units in the 2014-2018 return years.
	Hatchery	80.6	59	42.7	48.3	57.6	66.0	Brood 2015 fingerling lbs released from WDFW facilities in 2016, multiplied by the average of post-season estimated terminal area return rates for the last 5 years (2014-2018).
Strait of Juan de Fuca Including Dungeness spring run [e/]	Natural	3.8	4.9	3.7	3.1	6.0	8.3	Natural and hatchery. Dungeness and Elwha hatchery estimated by recent return rates times average releases. Dungeness wild estimated by smolts times average hatchery return rate. Elwha wild estimated using 9 year hatchery/wild breakouts from otolith and CWT.

a/ Since 2005, the upriver spring Chinook run includes Snake River summer Chinook.

b/ Since 2005, the upriver summer Chinook run includes only upper Columbia summer Chinook, and not Snake River summer Chinook.

c/ Expected spawning escapement without fishing.

d/ Unless otherwise noted, forecasts are for Puget Sound run size (4B) available to U.S. net fisheries. Does not include fish caught in troll and recreational fisheries.

e/ Terminal run forecast.

f/ Includes a mixture of runsize types including escapement without fishing and terminal run. 2019 values are escapement w/out fishing for Tulalip and Snohomish natural, and terminal runsize for Stillaguamish and Snohomish hatchery.

TABLE I-2. Preseason adult coho salmon stock forecasts in thousands of fish. (Page 1 of 2)

Production Source and Stock or Stock Group		Preseason Ocean Abundance Forecasts 2014	2015	2016	2017	2018	2019	Methodology for 2019 Prediction and Source
OPI Area Total Abundance (California, Oregon Coasts, and Columbia River)		1,213.7	1,015.0	549.2	496.2	349.0	1,009.6	Abundance of all OPI components based on cohort reconstruction including all fishery impacts using Mixed Stock Model (MSM); prior to 2008 only fishery impacts south of Leadbetter Point were used (traditional OPI accounting). OPITT, see Chapter III for details.
OPI Public	Hatchery	983.1	808.4	396.5	394.3	294.1	933.5	OPIH: Columbia River jacks adjusted for delayed smolt releases and total OPI jacks regressed on 1970-2018 adults. Columbia/Coastal proportions based on jacks; Columbia early/late proportions based on jacks; Coastal N/S proportions based on smolts.
Columbia River Early		526.6	515.2	153.7	231.7	164.7	545.0	
Columbia River Late		437.5	261.8	226.9	154.6	121.5	360.6	
Coastal N. of Cape Blanco		4.8	6.9	5.5	3.5	3.3	12.0	
Coastal S. of Cape Blanco		14.2	24.4	10.4	4.5	4.6	15.9	
Lower Columbia River	Natural	33.4	35.9	40.0	30.1	21.9	36.9	Oregon: recent two year average return; Washingtion: natural smolt production multiplied by 2016 brood marine survival rate. Abundance is subset of early/late hatchery abundance above.
Oregon Coast (OCN)	Natural	230.6	206.6	152.7	101.9	54.9	76.1	Rivers: Generalized additive model (GAM) relating ocean recruits to parental spawners and marine environmental variables. See text in Chapter III for details. Lakes: recent three year average abundance.
Washington Coast								
Willapa	Natural	58.9	42.9	39.5	36.7	20.6	63.4	Washington Coast stocks: A variety of methods were used for 2019, primarily based on smolt production and survival. See text in Chapter III for details.
	Hatchery	41.0	57.7	28.1	55.0	44.5	94.0	
Grays Harbor	Natural	108.8	142.6	35.7	50.0	42.4	71.5	
	Hatchery	65.4	46.6	22.9	36.4	51.4	64.3	
Quinault	Natural	25.0	44.2	17.1	26.3	25.4	13.9	
	Hatchery	24.7	24.9	19.8	29.4	29.6	26.9	
Queets	Natural	10.3	7.5	3.5	6.5	7.0	11.1	
	Hatchery	15.7	11.3	4.5	13.7	10.8	13.2	
Hoh	Natural	8.9	5.1	2.1	6.2	5.8	7.0	

TABLE I-2. Preseason adult coho salmon stock forecasts in thousands of fish. (Page 2 of 2)

Production Source and Stock or Stock Group		Preseason Ocean Abundance Forecasts 2014	2015	2016	2017	2018	2019	Methodology for 2019 Prediction and Source
Quillayute Fall	Natural	18.4	10.5	4.5	15.8	10.6	14.7	For all Washington Coast stocks: A variety of methods were used for 2019, primarily based on smolt production and survival. See text in Chapter III for details.
	Hatchery	12.6	8.0	6.4	17.6	16.5	17.0	
Quillayute Summer	Natural	2.0	1.2	0.3	1.5	2.7	1.2	
	Hatchery	3.2	2.2	1.4	3.4	3.3	3.4	
North Coast Independent Tributaries	Natural	15.2	11.7	1.9	6.5	4.1	8.1	
	Hatchery	11.6	11.9	2.5	0.2	7.9	12.5	
WA Coast Total	*Natural*	*247.5*	*265.6*	*104.6*	*149.5*	*118.7*	*191.0*	
	Hatchery	*174.2*	*162.6*	*85.6*	*155.6*	*164.1*	*231.3*	
Puget Sound								
Strait of Juan de Fuca	Natural	12.5	11.1	4.4	13.1	7.2	8.8	For all Puget Sound stocks: A variety of methods were used for 2019, primarily based on smolt production and survival. See text in Chapter III and Joint WDFW and tribal annual reports on Puget Sound Coho Salmon Forecast Methodology for details.
	Hatchery	17.3	11.1	3.9	15.4	10.6	16.8	
Nooksack-Samish	Natural	20.8	28.1	9.0	13.2	20.6	25.1	
	Hatchery	61.7	50.8	28.8	45.6	61.3	59.8	
Skagit	Natural	112.4	121.4	8.9	11.2	59.2	57.9	
	Hatchery	15.8	19.5	4.9	7.6	13.1	9.9	
Stillaguamish	Natural	32.5	31.3	2.8	7.6	19.0	23.8	
	Hatchery	6.0	0.0	0.0	1.5	0.0	2.2	
Snohomish	Natural	150.0	151.5	20.6	107.3	65.9	62.6	
	Hatchery	78.2	53.9	16.7	62.0	38.3	43.7	
South Sound	Natural	62.8	63.0	9.9	20.2	15.0	30.4	
	Hatchery	150.7	180.2	27.1	102.4	103.0	180.4	
Hood Canal	Natural	82.8	61.5	35.3	115.6	59.5	40.1	
	Hatchery	47.6	108.4	83.5	74.9	84.5	87.9	
Puget Sound Total	*Natural*	*473.8*	*467.9*	*91.0*	*288.3*	*246.4*	*248.8*	
	Hatchery	*377.3*	*423.9*	*165.0*	*309.3*	*310.8*	*400.7*	

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CHAPTER II: AFFECTED ENVIRONMENT - CHINOOK SALMON ASSESSMENT

CHINOOK STOCKS SOUTH OF CAPE FALCON

Sacramento River Fall Chinook

The SRFC stock comprises a large proportion of the Chinook spawners returning to Central Valley streams and hatcheries. SRFC are designated as the indicator stock for the Central Valley fall Chinook stock complex, which was established under FMP Amendment 16 to facilitate setting and assessing compliance with ABC and ACLs, as required by the 2006 revision of the MSA. The Sacramento Index (SI) is the aggregate-age index of adult SRFC ocean abundance.

Predictor Description

The SI is the sum of (1) adult SRFC ocean fishery harvest south of Cape Falcon, OR between September 1 and August 31, (2) adult SRFC impacts from non-retention ocean fisheries when they occur, (3) the recreational harvest of adult SRFC in the Sacramento River Basin, and (4) the SRFC adult spawner escapement (Table II-1, Figure II-1).

The SI forecasting approach uses jack escapement estimates to predict the SI and accounts for autocorrelated errors. In practice, this means that if, in the previous year, the modeled SI value was larger than the SI postseason estimate for that year, the current year forecast is adjusted downward to account for that error. Conversely, if the modeled SI value in the previous year was less than the postseason estimate of the SI for that year, the current year SI forecast would be adjusted upward to compensate for that error.

The forecast of the log-transformed SI was made using the model

$$\log \mathrm{SI}_t = \beta_0 + \beta_1 \log \mathrm{J}_{t-1} + \rho\varepsilon_{t-1} ,$$

where $\log \mathrm{SI}_t$ and $\log \mathrm{J}_{t-1}$ are log-transformed SI and jack escapement values, respectively; *t* is the year for which the SI is being forecast; β_0 is the intercept; β_1 is the slope; ρ is the autocorrelation coefficient; and ε_{t-1} is the difference between the modeled value of the log SI for year *t*-1 and the postseason estimate of log SI in year *t*-1. The $\log \mathrm{SI}_t$ is back-transformed to the arithmetic scale and corrected for bias in this transformation,

$$\mathrm{SI}_t = \mathrm{e}^{\log \mathrm{SI}_t + 0.5\sigma^2},$$

where σ^2 is the variance of the normally distributed error component of the fitted model (referred to as the "innovation" variance). A more detailed description of the forecast approach can be found in Appendix E of the 2014 Preseason Report I (PFMC 2014a).

Predictor Performance

The performance of past SI forecasts is displayed graphically in Figure II-4. For 2018, the postseason estimate of the SI was 223,854, which is 98 percent of the preseason forecast of 229,432.

A control rule, adopted as part of Amendment 16 to the salmon FMP, is used annually to specify the maximum allowable exploitation rate on SRFC (Appendix A, Figure A-1). The allowable exploitation rate is determined by the predicted number of potential adult spawners in the absence of fisheries, which is defined for SRFC as the forecast SI. The FMP allows for any ocean and river harvest allocation that meets the exploitation rate constraints defined by the control rule. The regulations adopted in 2018 were expected to result in 151,009 hatchery and natural area adult spawners and an exploitation rate of 34.2 percent.

Postseason estimates of these quantities were 105,739 hatchery and natural area adult spawners and an exploitation rate of 52.8 percent (Table II-1).

Stock Forecast and Status

Sacramento Index forecast model parameters were estimated from SI data for years 1983-2018 and jack escapement data for years 1982-2017. A total of 41,184 SRFC jacks were estimated to have escaped to Sacramento River basin hatcheries and natural spawning areas in 2018. This jack escapement and the estimated parameters

$\beta_o = 7.53758,$
$\beta_1 = 0.5466653,$
$\rho = 0.7726405,$
$\epsilon_{t-1} = -0.740665,$
$\sigma^2 = 0.1457727,$

result in a 2019 SI forecast of 379,632.

Figure II-2 graphically displays the 2019 SI forecast. The model fit (line in Figure II-2) was higher than the 2018 postseason estimate of the SI. As a result, the 2019 SI forecast value is adjusted downward from the fitted model.

The forecast SI applied to the SRFC control rule (Appendix A, Figure A-1) results in an allowable exploitation rate of 67.9 percent which produces, in expectation, 122,000 hatchery and natural area adult spawners. Therefore, fisheries impacting SRFC must be crafted to achieve, in expectation, a minimum of 122,000 adult spawners in 2019.

OFL, ABC, and ACL

The OFL, ABC, and ACL are defined in terms of spawner escapement (S_{OFL}, S_{ABC}, and S_{ACL}), and are calculated using potential spawner abundance forecasts and established exploitation rates. For SRFC, F_{MSY} = 0.78, the proxy value for Tier-2 Chinook stocks that do not have estimates of this rate derived from a stock-specific spawner-recruit analysis. The OFL for SRFC is S_{OFL} = 379,632 × (1-0.78) = 83,519. Because SRFC is a Tier-2 stock, $F_{ABC} = F_{MSY} \times 0.90 = 0.70$, and $F_{ACL} = F_{ABC}$. The ABC for SRFC is S_{ABC} = 379,632 × (1-0.70) = 113,890, with $S_{ACL} = S_{ABC}$. These preseason estimates will be recalculated with postseason abundance estimates (when available) to assess ACL and OFL compliance.

Sacramento River Winter Chinook

ESA-listed endangered SRWC are harvested incidentally in ocean fisheries, primarily off the central California coast. A two-part consultation standard for endangered SRWC was first implemented in 2012, and later updated in 2018.

The first component of the consultation standard is the season and size limit provisions that have been in place since the 2004 Biological Opinion. These provisions state that the recreational salmon fishery between Point Arena and Pigeon Point shall open no earlier than the first Saturday in April and close no later than the second Sunday in November. The recreational salmon fishery between Pigeon Point and the U.S.–Mexico Border shall open no earlier than the first Saturday in April and close no later than the first Sunday in October. The minimum size limit shall be at least 20 inches total length. The commercial salmon fishery between Point Arena and the U.S.–Mexico border shall open no earlier than May 1 and close no later than September 30, with the exception of an October fishery conducted Monday through Friday between Point

Reyes and Point San Pedro, which shall end no later than October 15. The minimum size limit shall be at least 26 inches total length.

The second component of the consultation standard is specified by a control rule that limits the maximum age-3 impact rate (allowable as a preseason forecast) for the area south of Point Arena, California (Appendix A, Figure A-3). The control rule specifies the maximum allowable age-3 impact rate on the basis of a forecast of the SRWC age-3 escapement in the absence of fisheries.

Predictor Description

The forecast of the age-3 escapement absent fishing (abundance) is based on a SRWC life cycle model that is stratified by age, sex, and origin (hatchery and natural). Juvenile survival rates spanning outmigration in freshwater and early ocean residence are applied to hatchery- and natural-origin juvenile production estimates. The age-3 escapement absent fishing is then forecasted by applying age- and sex-specific maturation rates and the age-3 natural mortality rate. The forecast is stochastic and thus the age-3 escapement absent fishing is represented by a distribution. The median of this distribution is applied to the control rule to specify the maximum allowable age-3 impact rate. A complete description of the abundance forecasting approach can be found in O'Farrell et al. (2016). The abundance forecasting approach used here is the Base model described in the aforementioned report.

Predictor Performance

The forecast of SRWC age-3 escapement absent fishing was implemented for the first time in 2018. A postseason estimate for 2018 is not available.

Stock Forecast and Status

The forecast of SRWC age-3 escapement absent fishing is 1,924. Application of the control rule results in a maximum age-3 impact rate of 15.7 percent for the area south of Point Arena in 2019 (Table II-2).

Klamath River Fall Chinook

Predictor Description

For Klamath River fall Chinook, linear regressions are used to relate September 1 ocean abundance estimates of age-3, age-4, and age-5 fish to that year's river run size estimates of age-2, age-3, and age-4 fish, respectively (Table II-3). Historical abundance estimates were derived from a cohort analysis of CWT information (brood years 1979-2014). The y-intercept of the regressions is constrained to zero, which gives the biologically reasonable expectation that a river run size of zero predicts an ocean abundance remainder of zero for the same cohort. The abundance of age-2 fish is not forecasted because no precursor to age-2 fish of that brood is available. Ocean fisheries harvest nominal numbers of age-2 KRFC.

Predictor Performance

Since 1985, the preseason ocean abundance forecasts for age-3 fish have ranged from 0.33 to 3.09 times the postseason estimates; for age-4 fish from 0.37 to 2.60 times the postseason estimates; and for the adult stock as a whole from 0.34 to 2.43 times the postseason estimates (Table II-4). The September 1, 2017 age-3 forecast (330,000) was 0.83 times its postseason estimate (397,568). The age-4 forecast (28,400) was 2.58 times its postseason estimate (11,008); and the age-5 forecast (800) was 16.0 times its postseason estimate (50). The preseason forecast of the adult stock as a whole was 0.88 times the postseason estimate.

Management of KRFC harvest since 1986 has attempted to achieve specific harvest rates on fully-vulnerable age-4 and age-5 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 harvest rate

objective set each year. Since 1992, fisheries have been managed to achieve 50/50 allocation between tribal and non-tribal fisheries. Tribal and recreational river fisheries have been managed on the basis of adult Chinook quotas.

The FMP describes a control rule used annually to specify the maximum allowable exploitation rate on KRFC (Appendix A, Figure A-2). The allowable exploitation rate is determined by the predicted number of potential spawners, which is defined as the natural area adult escapement expected in the absence of fisheries. The FMP allows for any ocean and river harvest allocation that meets the exploitation rate constraints defined by the control rule.

The 2018 salmon fishery regulations were expected to result in 40,700 natural-area spawning adults and an age-4 ocean harvest rate of 11.5 percent. Postseason estimates of these quantities were 53,624 natural-area adult spawners and an age-4 ocean harvest rate of 22.6 percent (Table II-5 and Table II-6).

Stock Forecast and Status

The 2019 forecast for the ocean abundance of KRFC as of September 1, 2018 (preseason) is 167,504 age-3 fish, 106,119 age-4 fish, and 599 age-5 fish.

Late-season commercial ocean fisheries in 2018 (September through November) were estimated to have harvested 157 adult KRFC, including 129 age-4. Late-season recreational ocean fisheries were estimated to have harvested 31 adult KRFC, all of which were age-4. For the two fisheries combined, this equates to a 0.2 percent age-4 ocean harvest rate, which will be deducted from the ocean fishery's allocation in determining the 2019 allowable ocean harvest.

The forecast of potential spawner abundance is derived from the ocean abundance forecasts, ocean natural mortality rates, age-specific maturation rates, stray rates, and the proportion of escapement expected to spawn in natural areas. The 2019 KRFC potential spawner abundance forecast is 87,893 natural-area adults. This potential spawner abundance forecast applied to the KRFC control rule results in an allowable exploitation rate of 53.7 percent, which produces, in expectation, 40,700 natural-area adult spawners. Therefore, fisheries impacting KRFC must be crafted to achieve, in expectation, a minimum of 40,700 natural-area adult spawners in 2019.

OFL, ABC, and ACL

The OFL, ABC, and ACL are defined in terms of spawner escapement (S_{OFL}, S_{ABC}, and S_{ACL}), and are calculated using potential spawner abundance forecasts and established exploitation rates. For KRFC, F_{MSY} = 0.71, the value estimated from a stock-specific spawner-recruit analysis (STT 2005). The OFL for KRFC is = 87,893 × (1-0.71) = 25,489. Because KRFC is a Tier-1 stock, $F_{ABC} = F_{MSY} \times 0.95 = 0.68$, and $F_{ACL} = F_{ABC}$. The ABC for KRFC is S_{ABC} = 87,893 × (1-0.68) = 28,126, with $S_{ACL} = S_{ABC}$. These preseason estimates will be recalculated with postseason abundance estimates (when available) to assess ACL and OFL compliance.

Other California Coastal Chinook Stocks

Other California coastal streams that support fall Chinook stocks which contribute to ocean fisheries off Oregon and California include the Smith, Little, Mad, Eel, Mattole, and Russian rivers, and Redwood Creek. Except for the Smith River, these stocks are included in the California coastal Chinook ESU, which is listed as threatened under the ESA. Current information is insufficient to forecast the ocean abundance of these stocks; however, the NMFS ESA consultation standard restricts the KRFC age-4 ocean harvest rate to no more than 16.0 percent to limit impacts on these stocks. In 2018, the age-4 ocean harvest rate was estimated to be 22.6 percent. The Klamath River spring, Smith River, Rogue River, Umpqua River,

and other Oregon Chinook stocks south of the Elk River are components of the Southern Oregon/Northern California (SONC) Chinook complex, and as such, specification of ACLs is deferred to KRFC, the indicator stock for the SONC Chinook complex.

Oregon Coast Chinook Stocks

Oregon coast Chinook stocks are categorized into three major subgroups based on ocean migration patterns: the North Oregon Coast (NOC) Chinook aggregate, the Mid Oregon Coast (MOC) Chinook aggregate, and the South Oregon Coast (SOC) Chinook aggregate. Although their ocean harvest distributions overlap somewhat, they have been labeled as far-north, north, or south/local migrating, respectively.

Far-North and North Migrating Chinook (NOC and MOC groups)

Far-north and north migrating Chinook stocks include spring and fall 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 NOC river systems from the Nehalem through the Siuslaw Rivers are harvested primarily in ocean fisheries off British Columbia and Southeast Alaska, and to a much lesser degree in Council area and terminal area (state waters) fisheries off Washington and Oregon. CWT analysis indicates populations from five major MOC systems, from the Coos through the Elk Rivers, are harvested primarily in ocean fisheries off British Columbia, Washington, Oregon, and in terminal area fisheries. Minor catches occur in California fisheries, and variable catches have been observed in southeast Alaska troll fisheries.

NOC and MOC Chinook stocks are components of the Far-North-Migrating Coastal (FNMC) Chinook complex, which is an exception to the ACL requirements of the MSA because they are managed under an international agreement (the PST); therefore, specification of ACLs is not necessary for stocks in the FNMC complex.

Predictor Description

Quantitative abundance predictions are made for all three of the coastal Chinook groups (NOC, MOC, and SOC), but are not used in annual development of Council area fishery regulations. Quantitative forecasts of abundance are based on sibling regression analyses from individual basins' escapement assessment data and scale sampling, which occur coast-wide. Forecast data for the NOC are used in the PSC management process in addition to terminal area management actions.

Natural spawner escapement is assessed yearly from the Nehalem through Sixes rivers. Peak spawning counts of adults are obtained from standard index areas on these rivers and monitored to assess stock trends (PFMC 2019, Chapter II, Table II-5 and Figure II-3). Natural fall Chinook stocks from both the NOC and MOC 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 released in the Trask, Nestucca, Salmon, Alsea, and Elk rivers.

Basin-specific forecasts constitute the overall aggregate forecasts and are derived in conjunction with annual PSC Chinook model input and calibration activities; however, they were not available at publication time.

Predictor Performance

There was no information available to evaluate performance of predictors for NOC and MOC stocks.

Stock Forecast and Status

North Oregon Coast

Since 1977, the Salmon River Hatchery production has been tagged for use primarily as a PSC indicator stock for the NOC stock component. Because these fish are primarily harvested in fisheries north of the Council management area, the STT has not reviewed the procedure by which this indicator stock is used in estimating annual stock status. The 2018 NOC density from standard survey areas (Nehalem R. through the Siuslaw R.) was a decrease from 2017 (PFMC 2019, Appendix B, Table B-11).

Based on the density index of total spawners, the generalized expectation for NOC stocks in 2019 is below recent years' average abundance. Specifically, the 2018 spawner density in standard survey areas for the NOC averaged 90 spawners per mile, the lowest since 2010.

Mid Oregon Coast

Since 1977, the Elk River Hatchery production has been tagged for potential use as a PSC indicator stock for the MOC stock aggregate. Beginning in 2019, Elk River Hatchery production was included as a PSC indicator stock. Age-specific ocean abundance forecasts for 2019 are not currently available, but are being developed. The STT has not undertaken a review of the methods used by Oregon Department of Fish and Wildlife (ODFW) staff in developing these abundance forecasts.

The 2018 MOC density from standard survey areas (Coos and Coquille basins) averaged 114 adult spawners per mile, an increase from 2017 (PFMC 2019, Appendix B, Table B-11). Fall Chinook escapement goals are currently under development for the South Umpqua and Coquille basins of the MOC.

South/Local Migrating Chinook (SOC group)

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

SOC stocks are components of the Southern Oregon/Northern California (SONC) Chinook complex, and as such, specification of ACLs is deferred to KRFC, the indicator stock for the SONC complex.

Rogue River Fall Chinook

Rogue River fall Chinook contribute to ocean fisheries principally as age-3 through age-5 fish. Mature fish enter the river each year from mid-July through October, with the peak of the run occurring during August and September.

Predictor Description

Carcass recoveries in Rogue River index surveys covering a large proportion of the total spawning area were available for 1977-2004. Using Klamath Ocean Harvest Model (KOHM) methodology, these carcass numbers, allocated into age-classes from scale data, were used to estimate the Rogue Ocean Population Index (ROPI) for age-3 to age-5 fish. A linear regression was developed using the escapement estimates (all ages) in year *t* based on seining at Huntley Park (1976-2004) to predict the ROPI in year *t*+1 (1977-2005).

Beginning in 2015, a revised predictor was used which relies on the Huntley Park escapement estimate and dispenses with the use of the carcass counts. Linear regressions are used to relate May 1 ocean abundance estimates of age-3, age-4, age-5, and age-6 Rogue fall Chinook to the previous year's river run size estimates of age-2, age-3, age-4, and age-5 fish, respectively. Historical May 1 ocean abundance estimates were derived from a cohort analysis of 1988-2006 brood years. May 1 (t) ocean abundances were converted to September 1 (t-1) forecasts by dividing the May (t) number by the assumed September 1 (t-1) through May 1 (t) survival rate of 0.5 age-3, 0.8 age-4, 0.8 age-5, and 0.8 age-6. River run size estimates are derived

from a flow-based expansion of standardized seine catches of fall Chinook at Huntley Park (RM 8). The y-intercept of the regressions is constrained to zero.

The 2018 Huntley Park escapement estimate and the resulting 2019 ROPI forecast of 383,500 consists of age-3 (305,400), age-4 (69,200) and age-5-6 (8,900) fish.

Predictor Performance

The ROPI is based on cohort reconstruction methods with index values predicted from regression equations. Because postseason estimates of the ROPI are not available, it is not possible to assess predictor performance.

Stock Forecast and Status

The 2019 ROPI is above recent years' average (Table II-7).

Other SOC Stocks

Umpqua and Rogue spring Chinook contribute to ocean fisheries primarily as age-3 fish. Mature Chinook enter the rivers primarily during April and May and generally prior to annual ocean fisheries.

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. Substantial releases of hatchery spring Chinook occur in both the Rogue and Umpqua rivers, although also present in lesser numbers are hatchery fall Chinook, primarily from the Chetco River.

These stocks are minor contributors to general season mixed-stock ocean fisheries. Standard fall Chinook spawning index escapement data were available for the smaller SOC rivers (Winchuck, Chetco, and Pistol rivers). These had been used for assessment of the conservation objective for the SOC stocks prior to 2015. The 2018 average density from standard survey areas was 14 adult spawners per mile, the lowest since 2008 (PFMC 2018, Appendix B, Table B-8). Beginning in 2015, for the SOC Chinook stock complex, the conservation objective is assessed using the escapement estimate of naturally produced fall Chinook at Huntley Park on the Rogue River (PFMC 2019, Appendix B, Table B-10, Chapter II, Table II-5 and Figure II-3).

CHINOOK STOCKS NORTH OF CAPE FALCON

Columbia River Chinook

Columbia River fall Chinook stocks 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, particularly ESA-listed Lower Columbia River (LCR) natural tule Chinook. Abundance predictions are made for five major fall stock units characterized as being hatchery or natural production, and originating above or below Bonneville Dam. The upriver brights (URB) and lower river wild (LRW) are primarily naturally-produced stocks, although the upriver brights do have a substantial hatchery component. The lower river hatchery (LRH) tule, Spring Creek Hatchery (SCH) tule, and Mid-Columbia Bright (MCB) are primarily hatchery-produced stocks. The MCB include the Lower River Bright (LRB) stock as a small naturally-produced component. LRB spawn in the mainstem Columbia River near Beacon Rock and are believed to have originated from MCB hatchery strays. The tule stocks generally mature at an earlier age than the bright fall stocks and do not migrate as far north. Minor fall stocks include the Select Area Bright (SAB), a stock originally from the Rogue River.

Upper Columbia River summer Chinook also contribute to Council area fisheries, although like URB and LRW, most ocean impacts occur in British Columbia (B.C.) and Southeast Alaska (SEAK) fisheries. Upper

Columbia River summer Chinook have both natural and hatchery components, and originate in areas upstream from Rock Island Dam.

URB and upper Columbia summer Chinook are exempt from the ACL requirements of the MSA because they are managed under an international agreement (the PST); therefore, specification of ACLs is not necessary for these two stocks. ESA consultation standards serve the purpose of ACLs for ESA-listed stocks like LRW Chinook. Broodstock goals serve the purpose of ACLs for hatchery-origin stocks like LRH, SCH, and MCB.

Predictor Description

Preseason forecasts of Columbia River fall and summer Chinook stock abundance, used by the STT to assess the Council's adopted fishery regulations, are based on age-specific and stock-specific forecasts of annual ocean escapement (returns to the Columbia River). These forecasts are developed by WDFW and a subgroup of the *U.S. v Oregon* Technical Advisory Committee (TAC). Columbia River return forecast methodologies used for Council management are identical to those used for planning Columbia River fall season fisheries, although minor updates to Council estimates of inriver run size may occur prior to finalization of the inriver fishery plans, based on the results of planned ocean fisheries.

The 2019 return of summer and each fall Chinook stock group is forecasted using relationships between successive age groups within a cohort. The database for these relationships was constructed by combining age-specific estimates of escapement and inriver fishery catches for years since 1964 (except for MCB, which started in the 1980s). Typically, only the more recent broods are used in the current predictions. Fall Chinook stock identification in the Columbia River mixed-stock fisheries is determined by sampling catch and escapement for CWTs 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 the return data presented in the *Review of 2018 Ocean Salmon Fisheries* (Appendix B, Tables B-15 through B-20). The 2018 returns for summer Chinook and the five fall Chinook stocks listed in this report may differ somewhat from those provided in the *Review of 2018 Ocean Salmon Fisheries*, since ocean escapement estimates may have been updated after that report was printed.

Summer and fall Chinook ocean escapement forecasts developed for the March Council meeting do not take into account variations in marine harvest. The STT combines the initial inriver run size (ocean escapement; Table II-8) with expected Council area fishery harvest levels and stock distribution patterns to produce adjusted ocean escapement forecasts based on the proposed ocean fishing regulations. These revised forecasts are available at the end of the Council preseason planning process in April and are used for preseason fishery modeling in the Columbia River.

Predictor Performance

Performance of the preliminary inriver run size estimation methodology can be assessed, in part, by examining the differences between preseason forecasts and postseason estimates (Table II-8; Figure II-4). The recent 10-year average March preliminary preseason forecasts as a percentage of the postseason estimates are 109 percent for URB, 107 percent for LRW, 117 percent for LRH, 146 percent for SCH, and 110 percent for MCB. None of the fall Chinook stocks had a notable bias in the recent time series of March preliminary forecasts, although all were slightly over-forecasted in March. The recent 5-year average March preliminary preseason forecasts as a percentage of the postseason estimates for summer Chinook is 100 percent.

Stock Forecasts and Status

The preliminary forecast for 2019 URB fall Chinook ocean escapement is 158,400 adults, about 106 percent of last year's return of 149,000 and about 37 percent of the recent 10-year average of 427,600. This forecast is about 79 percent of the 200,100 forecast in 2018 and is well below the strong returns that occurred during 2010-2016. This forecasted ocean escapement should allow for moderate ocean and in-river fisheries while achieving the FMP S_{MSY} conservation objective of 39,625 natural area spawners in the Hanford Reach, Yakima River, and areas above Priest Rapids Dam.

The forecast for the 2019 ocean escapement of ESA-listed Snake River wild fall Chinook is 8,600 adults.

Ocean escapement of LRW fall Chinook in 2019 is forecast at 13,700 adults, about 85 percent of the recent 10-year average return of 16,100. The forecast is about 165 percent of last year's actual return of 8,300. The spawning escapement goal of 5,700 in the North Fork Lewis River is expected to be achieved this year.

The preliminary forecast for 2019 ocean escapement of LRH fall Chinook is for a return of 54,500 adults, about 108 percent of last year's return of 50,400 and 60 percent of the recent 10-year average of 90,400. Based on this abundance forecast, the total allowable LCR natural tule exploitation rate for 2019 fisheries is no greater than 38.0 percent under the matrix developed by the Tule Chinook Workgroup in 2011, which is used by NMFS in developing ESA guidance for this stock (Appendix A Table A-6).

The preliminary ocean escapement forecast of SCH fall Chinook in 2019 is 46,000 adults, about 159 percent of last year's return of 28,900 and 57 percent of the 10-year average of 80,800.

The preliminary forecast for the 2019 ocean escapement of MCB fall Chinook is 56,700 adults, about 158 percent of last year's return of 36,000 and about 52 percent of the recent 10-year average of 108,600.

The preliminary forecast for summer Chinook in 2019 is 35,900 adults, approximately 85 percent of last year's return of 42,100 and about 44 percent of the recent 5-year average of 81,300. This ocean escapement should allow opportunity for both ocean and in-river fisheries while exceeding the FMP S_{MSY} conservation objective of 12,143 escapement above Rock Island Dam.

Washington Coast Chinook

Washington Coast Chinook consist of spring, summer, and fall stocks from Willapa Bay through the Hoko River. Based on limited CWT analysis, these populations are harvested primarily in ocean fisheries off British Columbia and Southeast Alaska, and to a lesser degree in Council-area fisheries off Washington and Oregon.

Washington Coast Chinook stocks are components of the FNMC Chinook complex, which is an exception to the ACL requirements of the MSA because it is managed under an international agreement (the PST); therefore, specification of ACLs is not necessary for stocks in the FNMC complex.

Predictor Description and Past Performance

Council fisheries have negligible impacts on Washington coast Chinook stocks and information to assess past performance is unavailable. However, abundance estimates are provided for Washington Coastal fall stocks in subsequent preseason fishery impact assessment reports prepared by the STT (e.g., Preseason Report III).

Stock Forecasts and Status

The 2019 Willapa Bay natural fall Chinook terminal runsize forecast is 4,309, which is above the FMP S_{MSY} conservation objective of 3,393. The hatchery fall Chinook terminal runsize forecast is 23,807.

The 2019 Grays Harbor spring Chinook terminal runsize forecast is 581, which is below the FMP S_{MSY} conservation objective of 1,400. The natural fall Chinook terminal runsize forecast was not available at the time of publication. The FMP S_{MSY} conservation objective is 13,326. The fall hatchery terminal runsize forecast was also not available at the time of publication.

The 2019 Quinault River natural fall Chinook terminal runsize forecast was not available at the time of publication. The fall hatchery terminal runsize forecast was also not available at the time of publication.

The 2019 Queets River spring Chinook terminal runsize forecast is 642, which is below the FMP S_{MSY} conservation objective of 700. The natural fall Chinook terminal runsize forecast was not available at the time of publication. The FMP S_{MSY} conservation objective is 2,500. The fall hatchery terminal runsize forecast was also not available at the time of publication.

The 2019 Hoh River natural spring/summer Chinook spawning escapement forecast is 1,023, which is above the FMP S_{MSY} conservation objective of 900. The natural fall Chinook forecast is 2,536, which is above the FMP S_{MSY} conservation objective of 1,200.

The 2019 Quillayute River hatchery spring Chinook ocean escapement forecast is 2,091 and the natural summer/fall Chinook forecast is 7,946 (1,301 summer and 6,645 fall). The FMP S_{MSY} conservation objectives are spawning escapements of 1,200 summer Chinook and 3,000 fall Chinook.

The 2019 Hoko River terminal runsize forecast is 2,809, which is above the FMP S_{MSY} conservation objective of 850.

Puget Sound Chinook

Puget Sound Chinook stocks include all fall, summer, and spring stocks originating from U.S. tributaries in Puget Sound and the eastern Strait of Juan de Fuca (east of Salt Creek, inclusive). Puget Sound Chinook consists of numerous natural Chinook stocks of small to medium-sized populations and substantial hatchery production. The Puget Sound ESU was listed under the ESA as threatened in March 1999.

Council-area fishery impacts to Puget Sound Chinook stocks are generally very low, on the order of 5 percent or less. NMFS issued a biological opinion in 2004 concluding that Council-area fisheries were not likely to jeopardize listed Puget Sound Chinook, and exempting these fisheries from the ESA section 9 take prohibition as long as they are consistent with the terms and conditions in the opinion. This opinion does not cover Puget Sound fisheries. In recent years, the comanagers have developed annual fishery management plans for Puget Sound and NMFS has issued one-year biological opinions for these plans exempting them from ESA section 9 take prohibitions. These opinions take into account the combined impacts of ocean and Puget Sound fisheries. Puget Sound stocks contribute to fisheries off B.C., are present to a lesser degree off SEAK, and are impacted to a minor degree by Council-area ocean fisheries. Because Council-area fishery impacts to Puget Sound Chinook stocks are minor, ocean regulations are not generally used to manage these stocks

Predictor Description

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-4 adults. The STT has not undertaken a review of the methods employed by state and tribal staffs in preparing these abundance forecasts. Run-size expectations for various Puget Sound stock management units are listed in Table I-1.

Predictor Performance

Performance of the preliminary inriver run size estimation methodology can be assessed, in part, by examining the differences between preseason forecasts and postseason estimates. Table II-9 compares preseason forecasts and postseason estimates of Puget Sound run size for summer/fall Chinook.

Stock Forecasts and Status

ACLs are undefined in the FMP for ESA-listed stocks like Puget Sound Chinook, and are deferred to ESA consultation standards.

Spring Chinook

Puget Sound Spring Chinook abundances remain depressed.

Summer/Fall Chinook

The 2019 preliminary natural Chinook return forecast is 36,200 and the preliminary hatchery Chinook return forecast is 207,800. The 2018 preseason natural Chinook return forecast was 33,100 and the hatchery Chinook return forecast was 220,800 (includes supplemental category forecasts).

Since ESA listing and development of the Resource Management Plan (RMP), fishery management for Puget Sound Chinook has changed from an escapement goal basis to the use of stock-specific exploitation rates and "critical abundance thresholds." This new approach is evaluated on an annual basis through the RMP.

STOCK STATUS DETERMINATION UPDATES

Sacramento River fall Chinook and Klamath River fall Chinook were found to meet the criteria for being classified as overfished in the PFMC *Review of 2017 Ocean Salmon Fisheries*, released in February 2018. These two stocks remain overfished at the current time, based on escapement estimates detailed in the PFMC *Review of 2018 Ocean Salmon Fisheries*, released in February 2019.

SELECTIVE FISHERY CONSIDERATIONS FOR CHINOOK

As the North of Falcon region has moved forward with mass marking of hatchery Chinook salmon stocks, the first mark selective fishery for Chinook salmon in Council waters was implemented in June 2010 in the recreational fishery north of Cape Falcon. In 2011 and 2012, the mark selective fishery in June was 8 and 15 days, respectively. In 2013 and 2014, the North of Falcon mark selective recreational fishery started in mid-May in Neah Bay and La Push subareas, then opened in all areas in late May or June. In 2015, the mark selective Chinook quota was 10,000 fish in the mid-May to mid-June fishery. There were no mark selective fisheries for Chinook in Council waters in 2016, 2017, and 2018. For 2019 preseason planning, selective fishing options for non-Indian fisheries may be under consideration in the ocean area from Cape Falcon, Oregon to the U.S./Canada border. Observed mark rates in previous mark selective fisheries north of Cape Falcon ranged from 53 to 71 percent. Similar mark rates are expected in this area for 2019.

TABLE II-1. Harvest and abundance indices for adult Sacramento River fall Chinook (SRFC) in thousands of fish. (Page 1 of 2)

	SRFC Ocean Harvest South of Cape Falcon[a/]				River	Spawning Escapement			Sacramento	Exploitation
Year	Troll	Sport	Non-Ret[b/]	Total	Harvest	Natural	Hatchery	Total	Index (SI)[c/]	Rate (%)[d/]
1983	246.6	86.3	0.0	332.9	18.0	91.7	18.6	110.2	461.1	76
1984	266.2	87.0	0.0	353.1	25.9	120.2	38.7	159.0	538.1	70
1985	355.5	158.9	0.0	514.4	39.1	210.1	29.3	239.3	792.8	70
1986	619.0	137.5	0.0	756.4	39.2	218.3	21.8	240.1	1,035.7	77
1987	686.1	173.1	0.0	859.2	31.8	175.2	19.8	195.1	1,086.1	82
1988	1,163.2	188.3	0.0	1,351.5	37.1	200.7	26.8	227.5	1,616.1	86
1989	602.8	157.1	0.0	759.9	24.9	127.6	24.9	152.6	937.3	84
1990	507.3	150.4	0.0	657.8	17.2	83.3	21.7	105.1	780.0	87
1991	300.1	89.6	0.0	389.7	26.0 [e/]	92.8	26.0	118.9	534.6	78
1992	233.3	69.4	0.0	302.8	13.3 [e/]	59.9	21.7	81.5	397.6	79
1993	342.8	115.3	0.0	458.1	27.7 [e/]	112.8	24.6	137.4	623.2	78
1994	303.5	168.8	0.0	472.3	28.9 [e/]	135.0	30.6	165.6	666.7	75
1995	730.7	390.4	0.0	1,121.0	48.2	253.8	41.5	295.3	1,464.6	80
1996	426.8	157.0	0.0	583.8	49.2	269.1	32.5	301.6	934.7	68
1997	579.7	210.3	0.0	790.0	56.3	281.6	63.3	344.8	1,191.1	71
1998	292.3	114.0	0.0	406.3	69.8 [e/]	176.0	69.9	245.9	722.1	66
1999	289.1	76.2	0.0	365.3	68.9 [e/]	357.6	42.2	399.8	834.0	52
2000	421.8	152.8	0.0	574.6	59.5 [e/]	370.0	47.6	417.5	1,051.6	60
2001	284.4	93.4	0.0	377.9	97.4	539.4	57.4	596.8	1,072.0	44
2002	447.7	184.0	0.0	631.7	89.2 [e/]	684.2	85.6	769.9	1,490.8	48
2003	501.6	106.4	0.0	608.0	85.4	414.6	108.4	523.0	1,216.3	57
2004	621.8	212.6	0.0	834.5	46.8	206.2	80.7	286.9	1,168.2	75
2005	367.9	127.0	0.0	494.9	64.6	214.9	181.1	396.0	955.5	59
2006	149.9	107.7	0.0	257.7	44.9	196.5	78.5	275.0	577.6	52
2007	120.0	32.0	0.0	152.0	14.3 [e/]	70.1	21.3	91.4	257.7	65
2008	3.2	0.9	0.0	4.1	0.1 [e/]	47.3	18.0	65.4	69.6	6
2009	0.0	0.2	0.1	0.3	0.0 [e/]	24.9	15.9	40.9	41.1	1
2010	11.2	11.4	0.3	22.8	2.7 [e/]	91.1	33.2	124.3	149.8	17

TABLE II-1. Harvest and abundance indices for adult Sacramento River fall Chinook (SRFC) in thousands of fish. (Page 2 of 2)

	SRFC Ocean Harvest South of Cape Falcon[a/]				River	Spawning Escapement			Sacramento	Exploitation
Year	Troll	Sport	Non-Ret[b/]	Total	Harvest	Natural	Hatchery	Total	Index (SI)[c/]	Rate (%)[d/]
2011	46.6	22.8	0.0	69.4	18.2 [e/]	77.9	41.5	119.3	207.0	42
2012	183.2	93.4	0.3	276.8	65.8 [e/]	166.2	119.2	285.4	628.0	55
2013	290.9	114.3	0.0	405.2	57.5 [e/]	305.6	101.2	406.8	869.6	53
2014	240.6	62.4	0.0	303.0	35.7 [e/]	168.3	44.2	212.5	551.2	61
2015	100.1	24.5	0.0	124.6	16.9 [e/]	74.8	39.3	114.1	255.6	55
2016	62.9	28.9	0.0	91.8	23.9 [e/]	56.3	33.4	89.7	205.3	56
2017	38.7	31.9	0.0	70.7	22.1 [e/]	18.0	24.8	42.7	135.5	68
2018[f/]	53.5	48.5	0.0	102.0	16.1 [e/]	71.9	33.8	105.7	223.9	53

a/ Ocean harvest for the period September 1 (t-1) through August 31 (t).

b/ Mortalities estimated from non-retention ocean fisheries (e.g., coho-only fisheries, non-retention GSI sampling). In 2008, there were 37 estimated mortalities as a result of non-retention fisheries that have been rounded to 0 in this table.

c/ The SI is the sum of (1) SRFC ocean fishery harvest south of Cape Falcon between September 1 and August 31, (2) SRFC impacts from non-retention ocean fisheries when they occur, (3) the recreational harvest of SRFC in the Sacramento River Basin, and (4) the SRFC spawner escapement.

d/ Total ocean harvest, non-retention ocean fishery mortalities, and river harvest of SRFC as a percentage of the SI.

e/ Estimates derived from CDFW Sacramento River Basin angler survey. Estimates not marked with a footnote are inferred from escapement data and the mean river harvest rate estimate.

f/ Preliminary.

TABLE II-2. Sacramento River winter Chinook escapement, allowable age-3 impact rates, and management performance.

				Age-3 impact rate south of Point Arena, CA		
Year	Escapement[a/]	3-yr GM Escapement[b/]	Abundance Forecast[c/]	Maximum Allowable (%)[d/]	Preseason Forecast (%)	Postseason Estimate (%)
2000	--	--	-	-	-	21.4
2001	8,224	--	-	-	-	23.3
2002	7,464	--	-	-	-	21.8
2003	8,218	--	-	-	-	10.3
2004	7,869	7,960	-	-	-	24.8
2005	15,839	7,844	-	-	-	17.2
2006	17,290	10,080	-	-	-	15.1
2007	2,541	12,917	-	-	-	17.8
2008	2,830	8,862	-	-	-	0.0
2009	4,537	4,991	-	-	-	0.0
2010	1,596	3,195	-	-	-	e/
2011	824	2,737	-	-	-	28.3
2012	2,671	1,814	-	13.7	13.7	12.6
2013	6,084	1,520	-	12.9	12.9	18.8
2014	3,015	2,375	-	15.4	15.4	15.8
2015	3,439	3,659	-	19.0	17.5	e/
2016	1,546	3,981	-	19.9	12.8	11.6
2017	975	2,521	-	15.8	12.2	17.1 [f/]
2018	2,638	1,731	1,594	14.4	8.5	NA [g/]
2019	NA	1,584	1,924	15.7	NA	NA

a/ Escapement includes jacks and adults spawning in natural areas and fish used for broodstock at Livingston Stone National Fish Hatchery.

b/ Geometric mean of escapement for the three prior years (e.g., 2017 GM computed from 2014-2016 escapement).

c/ Abundance forecast is defined as the predicted age-3 escapement in the absence of fisheries.

d/ Allowable impact rates from 2012-2017 were determined by a control rule utilizing the three-year geometric mean of escapement. Beginning in 2018, allowable impact rates were determined by a new control rule utilizing the abundance forecast.

e/ Insufficient data for postseason estimate.

f/ Preliminary. Incomplete cohort data (age-4 escapement unavailable).

g/ Not estimated. Incomplete cohort data (age-3 and age-4 escapement unavailable).

TABLE II-3. Klamath River fall Chinook ocean abundance (thousands), harvest rate, and river run size estimates (thousands) by age. (Page 1 of 2).

	Ocean Abundance Sept. 1 (t-1)			Annual Ocean Harvest Rate Sept. 1 (t-1) - Aug. 31 (t)		Klamath Basin River Run (t)				
Year (t)	Age-3	Age-4	Total	Age-3	Age-4	Age-2	Age-3	Age-4	Age-5	Total Adults
1981	493.2	57.0	550.2	0.21	0.53	28.2	64.1	14.4	1.8	80.3
1982	561.1	133.4	694.5	0.30	0.52	39.4	30.1	33.9	2.6	66.6
1983	313.3	114.2	427.5	0.19	0.60	3.8	35.9	20.7	0.9	57.5
1984	157.3	82.8	240.1	0.08	0.38	8.3	21.7	24.4	1.1	47.2
1985	374.8	56.9	431.7	0.11	0.24	69.4	32.9	25.7	5.8	64.4
1986	1,304.4	140.8	1,445.2	0.18	0.46	44.6	162.9	29.8	2.3	195.0
1987	781.1	341.9	1,123.0	0.16	0.43	19.1	89.7	112.6	6.8	209.1
1988	756.3	234.8	991.0	0.20	0.39	24.1	101.2	86.5	3.9	191.6
1989	369.8	177.2	547.1	0.15	0.36	9.1	50.4	69.6	4.3	124.3
1990	176.1	104.0	280.1	0.30	0.55	4.4	11.6	22.9	1.3	35.9
1991	69.4	37.2	106.6	0.03	0.18	1.8	10.0	21.6	1.1	32.7
1992	39.5	28.2	67.7	0.02	0.07	13.7	6.9	18.8	1.0	26.7
1993	168.5	15.0	183.5	0.05	0.16	7.6	48.3	8.2	0.7	57.2
1994	119.9	41.7	161.7	0.03	0.09	14.4	37.0	26.0	1.0	64.0
1995	787.3	28.7	816.0	0.04	0.14	22.8	201.9	18.3	2.6	222.8
1996	192.3	226.3	418.6	0.05	0.16	9.5	38.8	136.7	0.3	175.8
1997	140.2	62.8	203.0	0.01	0.06	8.0	35.0	44.2	4.6	83.7
1998	154.8	44.7	199.5	0.00	0.09	4.6	59.2	29.7	1.7	90.6
1999	129.1	30.5	159.5	0.02	0.09	19.2	29.2	20.5	1.3	51.0
2000	617.1	44.2	661.3	0.06	0.10	10.2	187.1	30.5	0.5	218.1
2001	356.1	133.8	489.9	0.03	0.09	11.3	99.1	88.2	0.1	187.3
2002	513.6	98.9	612.5	0.02	0.15	9.2	94.6	62.5	3.7	160.8
2003	401.1	192.2	593.3	0.08	0.21	3.8	94.3	96.8	0.9	191.9
2004	159.4	105.2	264.7	0.12	0.35	9.6	33.1	40.5	5.3	78.9
2005	190.0	38.1	228.1	0.02	0.20	2.3	43.8	17.5	3.9	65.2
2006	90.6	63.4	154.0	0.01	0.10	26.9	18.5	41.6	1.3	61.4
2007	376.9	33.6	410.5	0.06	0.21	1.7	113.7	16.8	1.6	132.1
2008	68.0	81.4	149.4	0.00	0.10	25.2	18.6	50.2	1.7	70.6
2009	240.7	21.1	261.8	0.00	0.00	11.9	78.6	16.4	5.6	100.6
2010	192.8	62.1	254.9	0.01	0.04	16.6	46.1	44.3	0.4	90.9

TABLE II-3. Klamath River fall Chinook ocean abundance (thousands), harvest rate, and river run size estimates (thousands) by age. (Page 2 of 2).

	Ocean Abundance Sept. 1 (t-1)			Annual Ocean Harvest Rate Sept. 1 (t-1) - Aug. 31 (t)		Klamath Basin River Run (t)				
Year (t)	Age-3	Age-4	Total	Age-3	Age-4	Age-2	Age-3	Age-4	Age-5	Total Adults
2011	240.2	64.6	304.7	0.03	0.08	84.9	59.0	41.0	2.0	102.0
2012	799.0	74.3	873.3	0.03	0.08	21.4	243.9	49.3	2.1	295.3
2013	438.3	194.4	632.6	0.04	0.20	14.4	55.2	108.8	1.1	165.0
2014	216.5	180.7	397.2	0.03	0.17	22.3	57.8	98.7	3.9	160.4
2015	110.6	61.0	171.6	0.02	0.22	6.1	36.7	34.0	7.1	77.8
2016	32.7	24.8	57.5	0.01	0.09	2.8	8.6	15.5	0.5	24.6
2017	63.4[a/]	9.8	73.2	0.02[a/]	0.04	20.3	24.4	7.3	1.6	33.2
2018	397.6[b/]	11.0[a/]	408.6	NA[c/]	0.23[a/]	11.1	86.7	5.6	0.0	92.3

a/ Preliminary: incomplete cohort data (age-5 unavailable).

b/ Preliminary: incomplete cohort data (age-4 and age-5 unavailable).

c/ Not estimated: incomplete cohort data (age-4 and age-5 unavailable).

TABLE II-4. Comparisons of preseason forecast and postseason estimates for ocean abundance of adult Klamath River fall Chinook. (Page 1 of 4)

Year (t)	Preseason Forecast[a/] Sept. 1 (t-1)	Postseason Estimate Sept. 1 (t-1)	Pre/Postseason
	Age-3		
1985	113,000	374,822	0.30
1986	426,000[b/]	1,304,409	0.33
1987	511,800	781,122	0.66
1988	370,800	756,261	0.49
1989	450,600	369,828	1.22
1990	479,000	176,122	2.72
1991	176,200	69,424	2.54
1992	50,000	39,502	1.27
1993	294,400	168,473	1.75
1994	138,000	119,915	1.15
1995	269,000	787,309	0.34
1996	479,800	192,272	2.50
1997	224,600	140,153	1.60
1998	176,000	154,799	1.14
1999	84,800	129,066	0.66
2000	349,600	617,097	0.57
2001	187,200	356,128	0.53
2002	209,000	513,604	0.41
2003	171,300	401,112	0.43
2004	72,100	159,446	0.45
2005	185,700	189,976	0.98
2006	44,100	90,606	0.49
2007	515,400	376,922	1.37
2008	31,600	68,003	0.46
2009	474,900	240,713	1.97
2010	223,400	192,760	1.16
2011	304,600	240,160	1.27
2012	1,567,600	799,014	1.96
2013	390,700	438,264	0.89
2014	219,800	216,499	1.02
2015	342,200	110,592	3.09
2016	93,400	32,668	2.86
2017	42,000	63,360	0.66
2018[c/]	330,000	397,568	0.83
2019	167,500	--	--

TABLE II-4. Comparisons of preseason forecasts and postseason estimates for ocean abundance of adult Klamath River fall Chinook. (Page 2 of 4)

Year (t)	Preseason Forecast[a/] Sept. 1 (t-1)	Postseason Estimate Sept. 1 (t-1)	Pre/Postseason
	Age-4		
1985	56,900	56,908	1.00
1986	66,300	140,823	0.47
1987	206,100	341,875	0.60
1988	186,400	234,751	0.79
1989	215,500	177,245	1.22
1990	50,100	103,951	0.48
1991	44,600	37,171	1.20
1992	44,800	28,169	1.59
1993	39,100	15,037	2.60
1994	86,100	41,736	2.06
1995	47,000	28,726	1.64
1996	268,500	226,282	1.19
1997	53,900	62,820	0.86
1998	46,000	44,733	1.03
1999	78,800	30,456	2.59
2000	38,900	44,176	0.88
2001	247,000	133,801	1.85
2002	143,800	98,927	1.45
2003	132,400	192,180	0.69
2004	134,500	105,246	1.28
2005	48,900	38,079	1.28
2006	63,700	63,383	1.01
2007	26,100	33,615	0.78
2008	157,200	81,408	1.93
2009	25,200	21,124	1.19
2010	106,300	62,092	1.71
2011	61,600	64,568	0.95
2012	79,600	74,289	1.07
2013	331,200	194,379	1.70
2014	67,400	180,662	0.37
2015	71,100	60,983	1.17
2016	45,100	24,826	1.82
2017	10,600	9,820	1.08
2018[c/]	28,400	11,008	2.58
2019	106,100	--	--

TABLE II-4. Comparisons of preseason forecasts and postseason estimates for ocean abundance of adult Klamath River fall Chinook. (Page 3 of 4)

Year (t)	Preseason Forecast[a/] Sept. 1 (t-1)	Postseason Estimate Sept. 1 (t-1)	Pre/Postseason
	Age-5		
1985	NA	11,113	NA
1986	NA	6,376	NA
1987	5,300	19,414	0.27
1988	13,300	14,632	0.91
1989	10,100	9,612	1.05
1990	7,600	7,767	0.98
1991	1,500	2,774	0.54
1992	1,300	1,444	0.90
1993	1,100	1,759	0.63
1994	500	1,468	0.34
1995	2,000	3,805	0.53
1996	1,100	788	1.40
1997	7,900	9,004	0.88
1998	3,300	2,382	1.39
1999	2,000	2,106	0.95
2000	1,400	1,051	1.33
2001	1,300	258	5.04
2002	9,700	6,933	1.40
2003	6,500	1,915	3.39
2004	9,700	17,184	0.56
2005	5,200	6,859	0.76
2006	2,200	5,236	0.42
2007	4,700	2,911	1.61
2008	1,900	2,900	0.66
2009	5,600	7,059	0.79
2010	1,800	517	3.48
2011	5,000	2,753	1.82
2012	4,600	5,110	0.90
2013	5,700	3,944	1.45
2014	12,100	7,623	1.59
2015	10,400	13,283	0.78
2016	3,700	1,144	3.23
2017	1,700	2,024	0.84
2018[c/]	800	50	16.00
2019	600	--	--

TABLE II-4. Comparisons of preseason forecasts and postseason estimates for ocean abundance of adult Klamath River fall Chinook. (Page 4 of 4)

Year (t)	Preseason Forecast[a/] Sept. 1 (t-1)	Postseason Estimate Sept. 1 (t-1)	Pre/Postseason
	Total Adults		
1985	169,900[d/]	442,843	0.38
1986	492,300[d/]	1,451,608	0.34
1987	723,200	1,142,411	0.63
1988	570,500	1,005,644	0.57
1989	676,200	556,685	1.21
1990	536,700	287,840	1.86
1991	222,300	109,369	2.03
1992	96,100	69,115	1.39
1993	334,600	185,269	1.81
1994	224,600	163,119	1.38
1995	318,000	819,840	0.39
1996	749,400	419,342	1.79
1997	286,400	211,977	1.35
1998	225,300	201,914	1.12
1999	165,600	161,628	1.02
2000	389,900	662,324	0.59
2001	435,500	490,187	0.89
2002	362,500	619,464	0.59
2003	310,200	595,207	0.52
2004	216,300	281,876	0.77
2005	239,800	234,914	1.02
2006	110,000	159,225	0.69
2007	546,200	413,448	1.32
2008	190,700	152,311	1.25
2009	505,700	268,896	1.88
2010	331,500	255,369	1.30
2011	371,100	307,481	1.21
2012	1,651,800	878,413	1.88
2013	727,700	636,587	1.14
2014	299,300	404,784	0.74
2015	423,800	184,858	2.29
2016	142,200	58,638	2.43
2017	54,200	75,204	0.72
2018[c/]	359,200	408,626	0.88
2019	274,200	--	--

a/ Original preseason forecasts for years 1985-2001 were for May 1 (t); converted to Sept. 1 (t-1) forecasts by dividing the May 1 (t) number by the assumed Sept. 1 (t-1) through May 1 (t) survival rate in those years: 0.5 age-3, 0.8 age-4, 0.8 age-5.

b/ A scalar of 0.75 was applied to the jack count to produce the forecast because, (1) most jacks returned to the Trinity River, and (2) the jack count was outside the database range.

c/ Postseason estimates are preliminary.

d/ Does not include age-5 adults.

TABLE II-5. Summary of management objectives and predictor performance for Klamath River fall Chinook.

Average or Year (t)	Preseason Ocean Abundance Sept. 1 (t-1) Forecast[a/]		Postseason Ocean Abundance Sept. 1 (t-1) Estimate		Preseason Age-4 Harvest Rate Forecast[b/]		Postseason Age-4 Harvest Rate Estimate[c/]		Preseason Adult Harvest Forecast		Postseason Adult Harvest Estimate	
	Age-3	Age-4	Age-3	Age-4	Ocean	River	Ocean	River	Ocean	River	Ocean	River
1986-90	447,640	144,880	677,548	199,729	0.30	0.51	0.44	0.54	104,100	56,020	214,598	51,814
1991-95	185,520	52,320	236,925	30,168	0.09	0.28	0.13	0.34	12,980	14,460	13,095	13,667
1996-00	262,960	97,220	246,677	81,693	0.11	0.44	0.10	0.33	30,500	44,180	21,336	31,382
2001	187,200	247,000	356,128	133,801	0.14	0.61	0.09	0.29	45,600	105,300	21,747	50,780
2002	209,000	143,800	513,604	98,927	0.13	0.57	0.15	0.26	30,000	70,900	28,896	35,069
2003	171,300	132,400	401,112	192,180	0.16	0.50	0.21	0.28	30,600	52,200	70,995	39,715
2004	72,100	134,500	159,446	105,246	0.15	0.38	0.35	0.48	26,500	35,800	64,226	29,807
2005	185,700	48,900	189,976	38,079	0.08	0.16	0.20	0.19	7,100	9,600	12,807	10,001
2006	44,100	63,700	90,606	63,383	0.11	0.23	0.10	0.18	10,000	10,000	10,401	10,345
2007	515,400	26,100	376,922	33,615	0.16	0.63	0.21	0.56	30,200	51,400	30,249	33,884
2008	31,600	157,200	68,003	81,408	0.02	0.43	0.10	0.38	4,500	49,500	8,718	24,180
2009	474,900	25,200	240,713	21,124	0.00	0.57	0.00	0.40	100	61,700	51	34,040
2010	223,400	106,300	192,760	62,092	0.12	0.49	0.04	0.40	22,600	46,600	4,497	32,920
2011	304,600	61,600	240,160	64,568	0.16	0.54	0.08	0.34	26,900	42,700	11,996	30,502
2012	1,567,600	79,600	799,014	74,289	0.16	0.77	0.08	0.51	92,400	227,600	34,721	109,263
2013	390,700	331,200	438,264	194,379	0.16	0.62	0.20	0.51	74,800	154,800	59,421	82,835
2014	219,800	67,400	216,499	180,662	0.16	0.40	0.17	0.25	23,200	31,400	40,152	31,353
2015	342,200	71,100	110,592	60,983	0.16	0.59	0.22	0.47	29,400	57,700	20,020	35,890
2016	93,400	45,100	32,668	24,826	0.08	0.19	0.09	0.31	6,300	8,500	3,064	6,470
2017[d/]	42,000	10,600	63,360	9,820	0.03	0.06	0.04	0.08	700	900	1,777	1,951
2018[e/]	330,000	28,400	397,568	11,008	0.12	0.34	0.23	0.36	14,600	21,600	14,863	18,844
2019	167,500	106,100	-	-	-	-	-	-	-	-	-	-

a/ Original preseason forecasts for years 1990-2001 were for May 1 (t); converted to Sept. 1 (t-1) forecasts by dividing the May 1 (t) number by the assumed Sept. 1 (t-1) through May 1 (t) survival rate in those years: 0.5 age-3, 0.8 age-4, 0.8 age-5.

b/ Ocean harvest rate forecast is the fraction of the predicted ocean abundance expected to be harvested Sept. 1 (t-1) through August 31(t). River harvest rate forecast is the fraction of the predicted river run expected to be harvested in river fisheries. Original ocean harvest rate forecasts for year (t), 1990-2001, were based on a May 1 (t) ocean abundance denominator; converted to Sept. 1 (t-1) abundance denominator by multiplying former values by 0.8

c/ Ocean harvest rate is the fraction of the postseason ocean abundance harvested Sept. 1 (t-1) through August 31 (t). River harvest rate is the fraction of the river run harvested by river fisheries.

d/ Postseason estimates are preliminary for age-3.

e/ Postseason estimates are preliminary for age-3 and age-4.

TABLE II-6. Harvest levels and rates of age-3 and age-4 Klamath River fall Chinook. (Page 1 of 4)

Year (t) or Average	Ocean Fisheries (Sept. 1 (t-1) - Aug. 31 (t))							River Fisheries (t)		
	KMZ			North of KMZ	South of KMZ	Subtotal	Ocean Total	Net	Sport	Total
	Troll	Sport	Subtotal							
					HARVEST (numbers of fish)					
Age-3										
1986-90	15,081	6,253	21,334	38,683	64,397	103,080	124,414	7,200	9,480	16,680
1991-95	8	689	698	3,055	5,086	8,141	8,839	4,980	2,189	7,170
1996-00	93	740	833	2,157	7,326	9,483	10,316	8,840	3,764	12,604
2001	113	105	218	2,749	6,082	8,831	9,049	17,885	7,294	25,179
2002	220	784	1,004	1,501	9,916	11,417	12,421	11,734	6,258	17,992
2003	176	669	845	1,921	27,586	29,507	30,352	6,996	5,061	12,057
2004	402	970	1,372	9,710	7,324	17,034	18,406	4,679	2,051	6,730
2005	0	568	568	619	2,381	3,000	3,568	4,394	1,641	6,035
2006	0	477	477	32	341	373	850	2,388	13	2,401
2007	770	8,101	8,871	4,194	9,367	13,561	22,432	17,543	5,734	23,277
2008	0	0	0	0	0	0	0	3,225	608	3,833
2009	0	51	51	0	0	0	51	19,820	4,715	24,535
2010	112	28	140	0	1,664	1,664	1,804	13,132	1,884	15,016
2011	334	1,119	1,453	35	4,830	4,865	6,318	13,286	2,630	15,916
2012	1,121	11,350	12,471	926	13,089	14,015	26,486	70,409	12,104	82,513
2013	390	5,574	5,964	865	11,986	12,851	18,815	18,996	7,675	26,671
2014	0	566	566	4,144	1,550	5,694	6,260	3,386	1,778	5,164
2015	48	293	341	652	1,597	2,249	2,590	10,604	4,509	15,113
2016	0	0	0	14	308	322	322	918	430	1,348
2017[a/]	0	0	0	114	1,258	1,372	1,372	1,261	23	1,284
2018[a/]	1,895	1,210	3,105	4,941	4,287	9,228	12,333	12,954	3,896	16,850

TABLE II-6. Harvest levels and rates of age-3 and age-4 Klamath River fall Chinook. (Page 2 of 4)

Year (t) or Average	Ocean Fisheries (Sept. 1 (t-1) - Aug. 31 (t))							River Fisheries (t)		
	KMZ			North of KMZ	South of KMZ	Subtotal	Ocean Total			
	Troll	Sport	Subtotal					Net	Sport	Total
					HARVEST (numbers of fish)					
Age-4										
1986-90	10,282	4,358	14,640	38,450	31,653	70,103	84,743	28,720	5,500	34,220
1991-95	34	484	519	1,438	1,807	3,245	3,764	5,072	856	5,928
1996-00	200	1,002	1,202	3,833	5,093	8,926	10,128	15,076	2,948	18,023
2001	1,312	1,604	2,916	5,819	3,926	9,745	12,661	20,759	4,819	25,578
2002	1,938	827	2,765	2,811	9,416	12,227	14,992	11,929	4,063	15,992
2003	834	919	1,753	7,856	30,011	37,867	39,620	22,754	4,592	27,346
2004	1,429	1,234	2,663	11,645	22,132	33,777	36,440	17,623	1,751	19,374
2005	247	317	564	5,243	1,909	7,152	7,716	3,048	304	3,352
2006	196	725	921	4,192	985	5,177	6,098	7,569	42	7,611
2007	270	2,336	2,606	1,991	2,472	4,463	7,069	8,987	502	9,489
2008	6,379	1,106	7,485	581	113	694	8,179	17,891	1,260	19,151
2009	0	0	0	0	0	0	0	5,831	706	6,537
2010	42	112	154	886	1,482	2,368	2,522	16,630	1,134	17,764
2011	417	176	593	1,043	3,780	4,823	5,416	12,587	1,466	14,053
2012	336	2,087	2,423	760	2,957	3,717	6,140	23,285	1,718	25,003
2013	4,265	6,236	10,501	4,047	23,993	28,040	38,541	43,671	12,043	55,714
2014	1,292	1,434	2,726	19,818	8,977	28,795	31,521	21,303	3,404	24,707
2015	273	197	470	5,763	7,128	12,891	13,361	13,160	2,692	15,852
2016	0	56	56	671	1,571	2,242	2,298	3,966	870	4,836
2017	0	124	124	98	183	281	405	503	43	546
2018[a/]	638	36	674	925	885	1,810	2,484	1,815	179	1,994

TABLE II-6. Harvest levels and rates of age-3 and age-4 Klamath River fall Chinook. (Page 3 of 4)

Year (t) or Average	Ocean Fisheries (Sept. 1 (t-1) - Aug. 31 (t))							River Fisheries (t)		
	KMZ			North of KMZ	South of KMZ	Subtotal	Ocean Total	Net	Sport	Total
	Troll	Sport	Subtotal							
					HARVEST RATE[b/]					
Age-3										
1986-90	0.02	0.01	0.03	0.08	0.09	0.17	0.20	0.09	0.11	0.20
1991-95	0.00	0.01	0.01	0.01	0.02	0.03	0.03	0.13	0.06	0.18
1996-00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.14	0.07	0.21
2001	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.18	0.07	0.25
2002	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.12	0.07	0.19
2003	0.00	0.00	0.00	0.00	0.07	0.07	0.08	0.07	0.05	0.13
2004	0.00	0.01	0.01	0.06	0.05	0.11	0.12	0.14	0.06	0.20
2005	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.10	0.04	0.14
2006	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.13	0.00	0.13
2007	0.00	0.02	0.02	0.01	0.02	0.04	0.06	0.15	0.05	0.20
2008	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.03	0.21
2009	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.06	0.31
2010	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.28	0.04	0.33
2011	0.00	0.00	0.01	0.00	0.02	0.02	0.03	0.23	0.04	0.27
2012	0.00	0.01	0.02	0.00	0.02	0.02	0.03	0.29	0.05	0.34
2013	0.00	0.01	0.01	0.00	0.03	0.03	0.04	0.34	0.14	0.48
2014	0.00	0.00	0.00	0.02	0.01	0.03	0.03	0.06	0.03	0.09
2015	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.29	0.12	0.41
2016	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.11	0.05	0.16
2017[a/]	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.05	0.00	0.05
2018[a/]	0.00	0.00	0.01	0.01	0.01	0.02	0.03	0.15	0.04	0.19

TABLE II-6. Harvest levels and rates of age-3 and age-4 Klamath River fall Chinook. (Page 4 of 4)

Year (t) or Average	Ocean Fisheries (Sept. 1 (t-1) - Aug. 31 (t))							River Fisheries (t)		
	KMZ			North of KMZ	South of KMZ	Subtotal	Ocean Total	Net	Sport	Total
	Troll	Sport	Subtotal							
					HARVEST RATE[b/]					
Age-4										
1986-90	0.05	0.02	0.07	0.21	0.16	0.37	0.44	0.45	0.09	0.54
1991-95	0.00	0.01	0.01	0.05	0.06	0.11	0.13	0.29	0.04	0.34
1996-00	0.00	0.01	0.01	0.05	0.04	0.09	0.10	0.28	0.05	0.33
2001	0.01	0.01	0.02	0.04	0.03	0.07	0.09	0.24	0.05	0.29
2002	0.02	0.01	0.03	0.03	0.10	0.12	0.15	0.19	0.06	0.26
2003	0.00	0.00	0.01	0.04	0.16	0.20	0.21	0.24	0.05	0.28
2004	0.01	0.01	0.03	0.11	0.21	0.32	0.35	0.43	0.04	0.48
2005	0.01	0.01	0.01	0.14	0.05	0.19	0.20	0.17	0.02	0.19
2006	0.00	0.01	0.01	0.07	0.02	0.08	0.10	0.18	0.00	0.18
2007	0.01	0.07	0.08	0.06	0.07	0.13	0.21	0.53	0.03	0.56
2008	0.08	0.01	0.09	0.01	0.00	0.01	0.10	0.36	0.03	0.38
2009	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.04	0.40
2010	0.00	0.00	0.00	0.01	0.02	0.04	0.04	0.37	0.03	0.40
2011	0.01	0.00	0.01	0.02	0.06	0.07	0.08	0.31	0.04	0.34
2012	0.00	0.03	0.03	0.01	0.04	0.05	0.08	0.47	0.03	0.51
2013	0.02	0.03	0.05	0.02	0.12	0.14	0.20	0.40	0.11	0.51
2014	0.01	0.01	0.02	0.11	0.05	0.16	0.17	0.22	0.03	0.25
2015	0.00	0.00	0.01	0.09	0.12	0.21	0.22	0.39	0.08	0.47
2016	0.00	0.00	0.00	0.03	0.06	0.09	0.09	0.26	0.06	0.31
2017	0.00	0.01	0.01	0.01	0.02	0.03	0.04	0.07	0.01	0.08
2018[a/]	0.06	0.00	0.06	0.08	0.08	0.16	0.23	0.33	0.03	0.36

a/ Preliminary (incomplete cohort).

b/ Ocean harvest rates are the fraction of Sept. 1 (t-1) ocean abundance harvested in these fisheries. River harvest rates are the fraction of the river run (t) harvested in these fisheries.

TABLE II-7. Rogue River fall Chinook inriver run and ocean population indices.

Return	Inriver Run Index in Thousands of Fish[a/]					Ocean Harvest Rate by Age[b/]		Rogue Ocean Population Index (ROPI) in Thousands of Fish[c/d/]			
Year	Age-2	Age-3	Age-4	Age-5-6	Total[d/]	Age-3	Age-4-6	Age-3	Age-4	Age-5-6	Total
1977-80	1.0	2.3	2.2	0.2	5.7	0.23	0.55	14.1	6.5	0.5	21.1
1981-85	21.4	17.6	22.9	2.3	64.1	0.18	0.45	197.5	60.0	16.6	274.1
1986-90	30.8	47.2	37.5	4.5	120.0	0.20	0.44	485.0	112.0	30.3	627.2
1991-95	16.7	28.9	17.2	3.5	66.4	0.03	0.13	165.1	51.2	11.8	228.2
1996-00	15.1	31.2	18.2	4.6	69.1	0.03	0.10	199.1	66.6	13.6	279.3
2001	27.9	29.5	33.9	16.6	107.9	0.03	0.09	164.8	146.2	18.6	329.6
2002	43.8	64.1	63.1	30.6	201.6	0.02	0.15	337.9	70.0	28.4	436.3
2003	20.1	66.9	99.0	47.0	233.0	0.08	0.21	530.4	151.9	52.2	734.5
2004	20.3	30.6	69.5	35.4	155.8	0.12	0.34	243.3	158.4	82.5	484.3
2005[f/]	5.0	17.7	28.7	11.6	63.0	0.02	0.20	245.2	72.6	58.2	376.0
2006	7.4	11.6	19.6	7.1	45.7	0.01	0.10	60.4	42.1	23.5	126.0
2007	3.4	15.8	16.6	12.7	48.5	0.06	0.21	89.5	27.5	15.8	132.9
2008	16.2	7.6	14.1	4.2	42.1	0.00	0.10	41.3	37.6	15.4	94.2
2009	15.2	34.3	28.0	4.5	82.0	0.00	0.00	195.9	18.0	11.4	225.3
2010	15.1	23.6	26.5	2.7	67.9	0.01	0.04	183.4	81.3	21.5	286.2
2011	31.9	25.1	41.1	5.5	103.6	0.03	0.08	183.2	56.0	19.9	259.1
2012	11.0	39.9	28.0	5.3	84.2	0.03	0.08	385.6	59.4	31.2	476.2
2013	24.3	17.0	66.1	3.1	110.5	0.04	0.20	133.4	94.5	21.7	249.6
2014	12.5	20.5	29.2	6.7	68.9	0.03	0.17	295.5	40.5	49.0	385.0
2015	8.5	6.8	23.1	3.0	41.4	0.02	0.22	151.5	48.5	22.8	222.8
2016	17.7	8.1	17.7	2.9	46.5	0.01	0.09	102.6	16.2	17.6	136.4
2017	25.0	58.6	24.4	12.7	122.5	0.02 [e/]	0.04	214.0	19.2	13.6	246.9 [e/]
2018	23.9	27.7	11.4	0.4	63.4	-	0.23 [e/]	303.0 [e/]	138.8 [e/]	21.0	462.8 [e/]
2019	NA	NA	NA	NA	NA	-	-	305.4 [f/]	69.2 [f/]	8.9 [f/]	383.5 [f/]

a/ Huntley Park passage estimate and estuary harvest. Age composition from Huntley Park scale analysis.

b/ Exploitation rates since 1981 are based on Klamath River fall Chinook cohort analysis.

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

d/ Rogue ocean abundances initially reconstructed to May 1 (t); converted to Sept. 1 (t-1) forecasts by dividing the May 1 (t) number by the assumed Sept. 1 (t-1) through May 1 (t) survival rate: 0.5 age-3, 0.8 age-4, 0.8 age-5, 0.8 age-6.

e/ Preliminary, complete cohort not available.

f/ Preseason forecast.

TABLE II-8. Predicted and postseason returns of Columbia River adult summer and fall Chinook in thousands of fish. (Page 1 of 3)

Year or Average	March Preseason Forecast[a/]	April STT Modeled Forecast[b/]	Postseason Return	March Pre/Postseason	April Pre/Postseason
			URB		
1984-85	124.6	126.1	163.9	0.75	0.76
1986-90	306.8	305.5	291.4	1.02	1.02
1991-95	86.2	91.5	105.3	0.83	0.87
1996-00	144.9	140.9	153.8	0.94	0.92
2001	127.2	132.7	232.6	0.55	0.57
2002	281.0	273.8	276.9	1.01	0.99
2003	280.4	253.2	373.2	0.75	0.68
2004	292.2	287.0	367.9	0.79	0.78
2005	352.2	354.6	268.7	1.31	1.32
2006	253.9	249.1	230.4	1.10	1.08
2007	182.4	185.2	112.6	1.62	1.64
2008	162.5	165.9	196.9	0.83	0.84
2009	259.9	269.8	212.0	1.23	1.27
2010	310.8	319.1	324.9	0.96	0.98
2011	398.2	399.5	324.1	1.23	1.23
2012	353.5	353.0	298.1	1.19	1.18
2013	432.5	434.7	784.1	0.55	0.55
2014	973.3	919.4	684.2	1.42	1.34
2015	500.3	516.2	795.9	0.63	0.65
2016	589.0	579.4	406.6	1.45	1.42
2017	260.0	275.1	297.1	0.88	0.93
2018[c/]	200.1	205.8	149.0	1.34	1.38
2019	158.4	-	-	-	-
			LRW		
1984-85	14.8	NA	13.3	1.12	NA
1986-90	27.8	30.8	32.6	0.86	0.95
1991-95	13.9	13.2	14.8	0.99	0.93
1996-00	6.1	5.5	9.5	0.69	0.62
2001	16.7	18.5	15.7	1.06	1.18
2002	18.7	18.3	24.9	0.75	0.73
2003	24.6	23.4	26.0	0.95	0.90
2004	24.1	24.2	22.3	1.08	1.09
2005	20.2	21.4	16.8	1.20	1.27
2006	16.6	16.6	18.1	0.92	0.92
2007	10.1	10.0	4.3	2.35	2.33
2008	3.8	3.8	7.1	0.54	0.54
2009	8.5	8.6	7.5	1.13	1.15
2010	9.7	10.0	10.9	0.89	0.92
2011	12.5	13.1	15.2	0.82	0.86
2012	16.2	16.2	13.9	1.17	1.17
2013	14.2	14.3	25.8	0.55	0.55
2014	34.2	33.4	25.8	1.33	1.29
2015	18.9	19.4	32.4	0.58	0.60
2016	22.2	22.4	13.0	1.71	1.72
2017	12.5	13.6	7.8	1.60	1.74
2018[c/]	7.6	7.9	8.3	0.92	0.95
2019	13.7	-	-	-	-

TABLE II-8. Predicted and postseason returns of Columbia River adult summer and fall Chinook in thousands of fish.
(Page 2 of 3)

Year	March Preseason Forecast[a/]	April STT Modeled Forecast[b/]	Postseason Return	March Pre/Postseason	April Pre/Postseason
			LRH		
1984-85	76.0	87.9	106.7	0.71	0.83
1986-90	209.8	204.2	234.9	0.91	0.88
1991-95	67.2	72.2	55.5	1.18	1.28
1996-00	33.9	40.8	49.0	0.72	0.86
2001	32.2	30.5	94.3	0.34	0.32
2002	137.6	133.0	156.4	0.88	0.85
2003	115.9	116.9	155.0	0.75	0.75
2004	77.1	79.0	108.9	0.71	0.73
2005	74.1	78.4	78.3	0.95	1.00
2006	55.8	57.5	58.3	0.96	0.99
2007	54.9	54.4	32.7	1.68	1.66
2008	59.0	55.9	60.3	0.98	0.93
2009	88.8	88.2	76.7	1.16	1.15
2010	90.6	85.6	103.0	0.88	0.83
2011	133.5	128.9	109.0	1.22	1.18
2012	127.0	128.4	84.8	1.50	1.51
2013	88.0	87.4	103.2	0.85	0.85
2014	110.0	100.7	101.8	1.08	0.99
2015	94.9	96.8	128.7	0.74	0.75
2016	133.7	142.5	81.9	1.63	1.74
2017	92.4	98.8	64.6	1.43	1.53
2018[c/]	62.4	63.9	50.4	1.2	1.3
2019	54.5	-	-	-	-
			SCH		
1984-85	28.1	32.1	40.4	0.75	0.85
1986-90	17.7	15.6	16.7	1.01	0.92
1991-95	31.0	34.5	30.2	1.05	1.18
1996-00	30.3	32.6	30.3	0.94	1.05
2001	56.6	61.9	125.0	0.45	0.50
2002	144.4	136.0	160.8	0.90	0.85
2003	96.9	101.9	180.6	0.54	0.56
2004	138.0	150.0	175.3	0.79	0.86
2005	114.1	115.8	93.1	1.23	1.24
2006	50.0	51.8	27.9	1.79	1.86
2007	21.8	21.3	14.6	1.49	1.46
2008	87.2	86.2	91.9	0.95	0.94
2009	59.3	56.5	49.0	1.21	1.15
2010	169.0	162.9	130.8	1.29	1.25
2011	116.4	116.7	70.1	1.66	1.66
2012	63.8	60.0	56.8	1.12	1.06
2013	38.0	36.7	86.6	0.44	0.42
2014	115.1	103.3	127.0	0.91	0.81
2015	160.5	163.9	166.4	0.96	0.98
2016	89.5	100.7	44.6	2.01	2.26
2017	158.4	164.4	48.2	3.29	3.41
2018[c/]	50.1	51.4	28.9	1.73	1.78
2019	46.0	-	-	-	-

TABLE II-8. Predicted and postseason returns of Columbia River adult summer and fall Chinook in thousands of fish. (Page 3 of 3)

Year	March Preseason Forecast[a/]	April STT Modeled Forecast[b/]	Postseason Return	March Pre/Postseason	April Pre/Postseason
			MCB		
1991-95	34.6	35.6	32.4	1.08	1.10
1996-00	49.9	47.9	48.6	1.07	1.04
2001	43.5	45.3	76.4	0.57	0.59
2002	96.2	91.8	108.4	0.89	0.85
2003	104.8	94.6	150.2	0.70	0.63
2004	90.4	88.8	117.6	0.77	0.76
2005	89.4	89.7	98.0	0.91	0.92
2006	88.3	86.6	80.4	1.10	1.08
2007	68.0	69.1	46.9	1.45	1.47
2008	54.0	55.1	75.5	0.72	0.73
2009	94.4	97.9	73.1	1.29	1.34
2010	79.0	74.6	79.0	1.00	0.94
2011	100.0	100.4	85.4	1.17	1.18
2012	90.8	90.7	58.7	1.55	1.55
2013	105.2	96.3	243.4	0.43	0.40
2014	360.1	340.2	203.8	1.77	1.67
2015	113.3	116.9	170.6	0.66	0.69
2016	101.0	99.4	88.3	1.14	1.13
2017	45.6	48.3	47.4	0.96	1.02
2018[c/]	36.4	41.2	36.0	1.01	1.14
2019	56.7	-	-	-	-
			SUMMER		
2008	52.0		55.5	0.94	
2009	70.7		53.9	1.31	
2010	88.8		72.3	1.23	
2011	91.1		80.6	1.13	
2012	91.2	92.6	58.3	1.56	1.59
2013	73.5	78.5	67.6	1.09	1.16
2014	67.5	64.7	78.3	0.86	0.83
2015	73.0	100.1	126.9	0.58	0.79
2016	93.3	95.6	91.0	1.03	1.05
2017	63.1	64.8	68.2	0.93	0.95
2018[c/]	67.3	70.5	42.1	1.60	1.67
2019	35.9	-	-	-	-

a/ March preseason forecasts are ocean escapements based on terminal run size and stock-specific cohort relationships affected by the historical "normal" ocean fisheries, generally between 1979 and the most recent complete broods.

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

c/ Postseason estimates are preliminary.

TABLE II-9. Preseason forecasts and postseason estimates of Puget Sound run size for summer/fall Chinook in thousands of fish.[a/] (Page 1 of 4)

Year or Average	Preseason Forecast	Postseason Return	Pre/Post-season	Preseason Forecast	Postseason Return	Pre/Post-season	Preseason Forecast	Postseason Return	Pre/Post-season	Preseason Forecast	Postseason Return	Pre/Post-season
	Nooksack-Samish Hatchery and Natural			**East Sound Bay Hatchery**			**Skagit Hatchery**			**Skagit Natural**		
1993-95	45.2	27.6	1.65	3.3	1.6	9.41	1.3	3.4	0.47	9.1	7.3	1.33
1996-00	27.0	35.4	0.77	2.1	0.5	13.35	0.2	0.2	0.87	7.0	10.9	0.80
2001	34.9	65.6	0.53	1.6	0.9	1.85	0.0	0.0	-	9.1	14.1	0.64
2002	52.8	57.0	0.93	1.6	0.9	1.87	0.0	0.1	0.00	13.8	20.0	0.69
2003	45.8	30.0	1.53	1.6	0.2	7.51	0.0	0.3	0.00	13.7	10.3	1.33
2004	34.2	18.1	1.89	0.8	0.0	200.00	0.5	0.0	-	20.3	24.3	0.84
2005	19.5	16.5	1.18	0.4	0.0	13.33	0.7	0.4	1.88	23.4	23.4	1.00
2006	16.9	31.9	0.53	0.4	0.0	25.00	0.6	0.4	1.51	24.1	22.5	1.07
2007	18.8	26.5	0.71	0.4	0.0	66.67	1.1	0.4	2.75	15.0	13.0	1.15
2008	35.3	29.1	1.21	0.8	0.0	-	0.7	0.2	3.50	23.8	15.0	1.59
2009	23.0	20.9	1.10	0.1	0.0	25.00	0.6	0.1	6.00	23.4	12.5	1.87
2010	30.3	35.8	0.85	2.3	0.7	3.29	0.9	0.1	11.25	13.0	10.0	1.30
2011	37.5	33.3	1.13	0.4	0.7	0.57	1.5	0.1	15.00	14.3	9.2	1.55
2012	44.0	32.6	1.35	0.4	1.6	0.25	1.3	0.1	13.00	8.3	15.8	0.53
2013	47.2	31.4	1.50	2.0	1.1	1.82	0.3	0.1	3.00	12.9	13.0	0.99
2014	43.9	25.5	1.72	1.2	0.3	4.00	0.3	0.0	7.50	18.0	10.1	1.78
2015	38.6	18.1	2.13	1.2	0.9	1.33	0.6	0.0	-	11.8	14.8	0.80
2016	27.9	15.8	1.77	0.7	0.7	1.00	0.4	0.1	4.00	15.1	21.1	0.72
2017[b/]	21.2	17.2	1.23	0.8	0.5	1.70	0.4	0.1	4.08	15.8	13.6	1.16
2018	24.6	NA	-	0.7	NA	-	0.3	NA	-	13.3	NA	-
2019	21.3	-	-	0.3	-	-	0.3	-	-	13.6	-	-

TABLE II-9. Preseason forecasts and postseason estimates of Puget Sound run size for summer/fall Chinook in thousands of fish.[a/] (Page 2 of 4)

Year or Average	Preseason Forecast	Postseason Return	Pre/Post-season	Preseason Forecast	Postseason Return	Pre/Post-season	Preseason Forecast	Postseason Return	Pre/Post-season	Preseason Forecast	Postseason Return	Pre/Post-season
	Stillaguamish [c/] Natural			**Snohomish [c/] Hatchery**			**Snohomish [c/] Natural**			**Tulalip [c/] Hatchery**		
1993-95	1.8	1.2	1.92	2.0	4.1	0.29	4.6	4.8	0.96	2.6	3.9	1.30
1996-00	1.6	1.3	1.20	7.0	5.6	1.67	5.3	5.5	0.98	3.7	10.1	0.39
2001	1.7	1.4	1.22	4.1	0.9	4.57	5.8	8.4	0.69	5.5	5.1	1.08
2002	2.0	1.6	1.25	6.8	2.6	2.66	6.7	7.3	0.92	5.8	5.2	1.12
2003	2.0	1.0	1.98	9.4	5.8	1.63	5.5	5.6	0.99	6.0	8.7	0.69
2004	3.3	1.6	2.06	10.1	6.4	1.58	15.7	11.2	1.40	6.8	6.5	1.05
2005	2.0	1.2	1.67	9.9	4.0	2.48	14.2	5.0	2.84	6.4	7.4	0.86
2006	1.6	1.3	1.26	9.6	4.3	2.23	8.7	8.8	0.99	9.3	5.8	1.60
2007	1.9	0.8	2.38	8.7	6.6	1.32	12.3	4.0	3.08	8.4	6.1	1.38
2008	1.1	1.8	0.61	8.8	6.3	1.40	6.5	8.7	0.75	2.7	3.2	0.84
2009	1.7	1.2	1.42	4.9	2.2	2.23	8.4	2.3	3.65	4.0	1.7	2.35
2010	1.4	1.0	1.40	5.6	2.7	2.07	9.9	4.8	2.06	3.4	3.2	1.06
2011	1.8	1.3	1.38	5.2	3.1	1.68	7.4	2.0	3.70	3.5	5.8	0.60
2012	0.9	1.7	0.53	3.9	8.4	0.46	2.8	3.4	0.82	5.9	0.6	9.83
2013	1.3	0.9	1.44	5.9	6.1	0.97	3.6	2.6	1.38	10.9	1.9	5.74
2014	1.6	0.4	4.00	5.4	6.2	0.87	5.3	2.4	2.21	4.7	1.8	2.61
2015	0.5	0.6	0.83	3.3	4.8	0.69	4.2	2.3	1.83	1.3	2.0	0.65
2016	0.5	0.5	1.00	5.0	10.0	0.50	3.3	3.5	0.94	1.4	6.0	0.23
2017[b/]	1.5	1.7	0.89	4.8	9.0	0.53	3.4	4.4	0.78	5.3	11.3	0.47
2018	1.6	NA	-	6.5	NA	-	3.5	NA	-	7.5	NA	-
2019	0.9	-	-	7.2	-	-	3.7	-	-	12.7	-	-

TABLE II-9. Preseason forecasts and postseason estimates of Puget Sound run size for summer/fall Chinook in thousands of fish.[a/] (Page 3 of 4)

Year or Average	Preseason Forecast	Postseason Return	Pre/Post-season	Preseason Forecast	Postseason Return	Pre/Post-season	Preseason Forecast	Postseason Return	Pre/Post-season	Preseason Forecast	Postseason Return	Pre/Post-season
	South Puget Sound Hatchery			**South Puget Sound Natural**			**Strait of Juan de Fuca Hatchery**			**Strait of Juan de Fuca Natural**		
1993-95	54.7	56.1	1.05	22.1	15.0	1.78	2.5	0.9	2.85	1.7	1.6	1.10
1996-00	64.3	51.1	1.31	19.2	24.0	0.96	2.1	1.2	1.91	0.9	2.3	0.43
2001	73.7	76.6	0.96	16.2	60.6	0.27	0.0	1.7	0.00	3.5	2.0	1.79
2002	90.8	69.3	1.31	16.9	57.0	0.30	0.0	1.6	0.00	3.6	2.2	1.65
2003	86.6	57.2	1.51	19.6	38.6	0.51	0.0	1.3	0.00	3.4	2.8	1.21
2004	86.5	66.6	1.30	17.5	42.3	0.41	0.0	1.4	0.00	3.6	4.1	0.89
2005	83.1	73.9	1.12	17.7	19.0	0.93	0.0	1.4	0.00	4.2	2.1	2.00
2006	85.8	104.1	0.82	21.3	37.0	0.58	0.0	1.2	0.00	4.2	3.2	1.31
2007	83.0	140.3	0.59	17.0	30.1	0.56	0.0	0.8	0.00	4.4	1.3	3.38
2008	101.6	90.6	1.12	21.1	32.2	0.65	0.0	0.7	0.00	3.2	1.2	2.67
2009	93.0	72.7	1.28	17.2	13.3	1.29	0.0	1.5	0.00	2.4	1.3	1.85
2010	97.4	82.9	1.17	12.7	15.8	0.80	0.0	0.7	0.00	1.9	2.6	0.73
2011	118.6	83.9	1.41	8.9	20.6	0.43	0.0	0.7	0.00	2.5	2.9	0.86
2012	95.8	61.9	1.55	8.9	23.0	0.39	0.0	1.2	0.00	2.9	2.1	1.38
2013	102.0	75.5	1.35	5.0	22.2	0.23	2.7	2.1	1.29	1.6	4.8	0.33
2014	96.7	37.1	2.61	4.8	7.1	0.68	3.8	2.0	1.90	1.5	4.2	0.36
2015	62.4	47.1	1.32	3.8	5.5	0.69	4.9	2.8	1.75	3.5	4.5	0.78
2016	43.1	83.8	0.51	4.5	6.0	0.75	4.3	1.9	2.26	2.3	2.6	0.88
2017[b/]	80.4	143.4	0.56	5.7	8.7	0.66	3.8	2.0	1.94	0.8	3.3	0.24
2018	123.6	NA	-	4.8	NA	-	6.0	NA	-	1.4	NA	-
2019	99.9	-	-	8.4	-	-	7.7	-	-	0.6	-	-

TABLE II-9. Comparison of preseason forecasts and postseason estimates of Puget Sound run size for summer/fall Chinook in thousands of fish.[a/] (Page 4 of 4)

Year or Average	Preseason Forecast	Postseason Return	Pre/Post-season
		Hood Canal Hatchery and Natural	
1993-95	11.6	8.4	1.46
1996-00	7.3	26.4	0.26
2001	19.2	26.1	0.74
2002	25.3	30.2	0.84
2003	24.0	33.0	0.73
2004	29.6	34.3	0.86
2005	30.6	54.7	0.56
2006	30.2	40.7	0.74
2007	47.5	32.5	1.46
2008	36.8	33.1	1.11
2009	42.6	38.0	1.12
2010	45.0	37.8	1.19
2011	40.6	53.2	0.76
2012	46.8	90.3	0.52
2013	66.2	71.7	0.92
2014	84.1	25.2	3.34
2015	62.1	33.0	1.88
2016	45.0	63.6	0.71
2017[b/]	50.8	111.0	0.46
2018	61.4	NA	-
2019	67.2	-	-

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 inside Puget Sound.

b/ Postseason returns are preliminary.

c/ These numbers are in terms of terminal run of Chinook returning to area 8A. This includes all adult Chinook harvested in the net fisheries in Areas 8A, 8D, the Stillaguamish and Snohomish Rivers harvest in sport fisheries in Area 8D and the Stillaguamish and Snohomish Rivers and escapement.

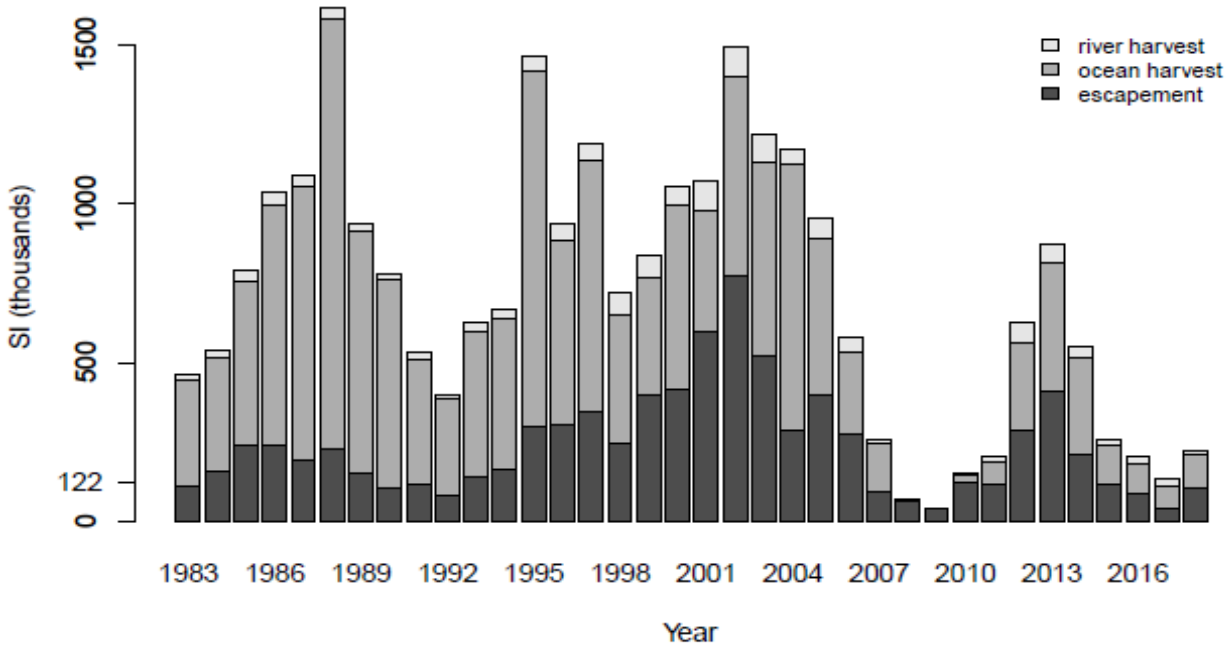

FIGURE II-1. The Sacramento Index (SI) and relative levels of its components. The Sacramento River fall Chinook S_{MSY} of 122,000 adult spawners is noted on the vertical axis.

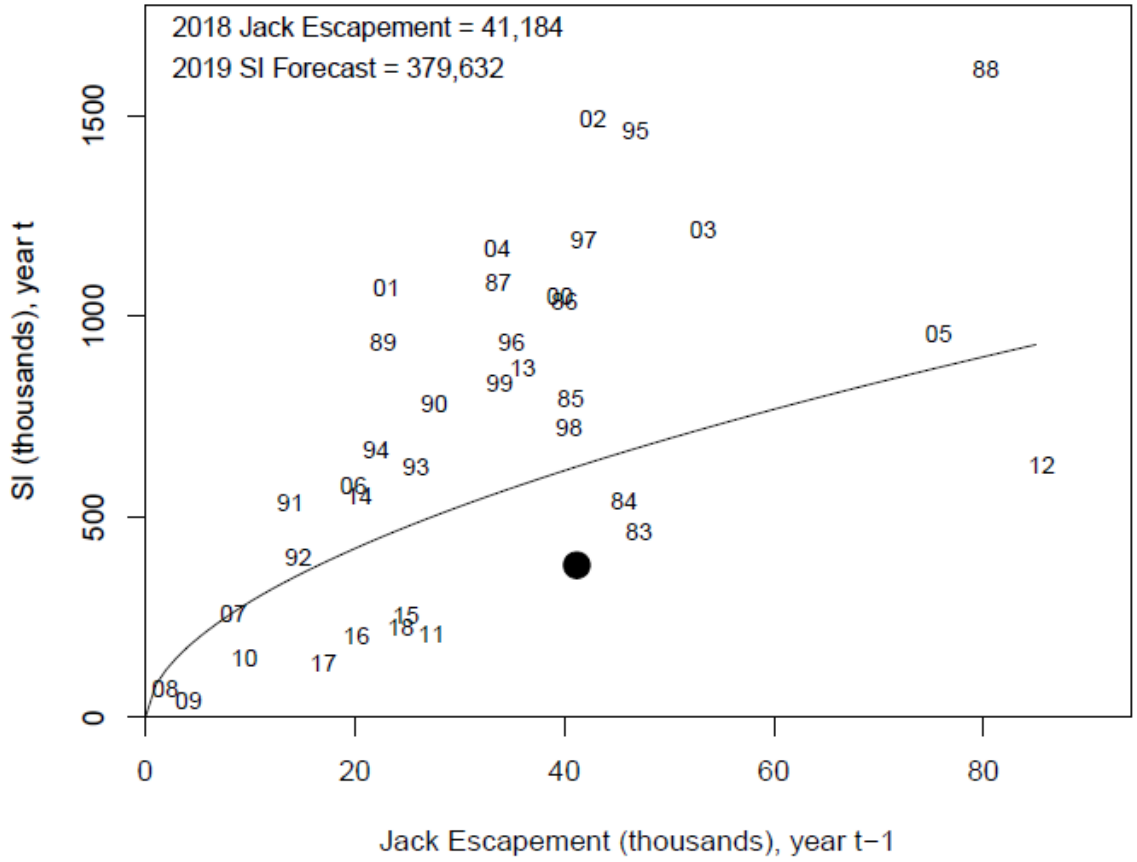

FIGURE II-2. Sacramento Index (SI) forecast based on log-log regression of the SI on jack escapement from the previous year, accounting for autocorrelated errors. The solid line represents the fitted model and the black dot denotes the SI forecast. Years shown are SI years.

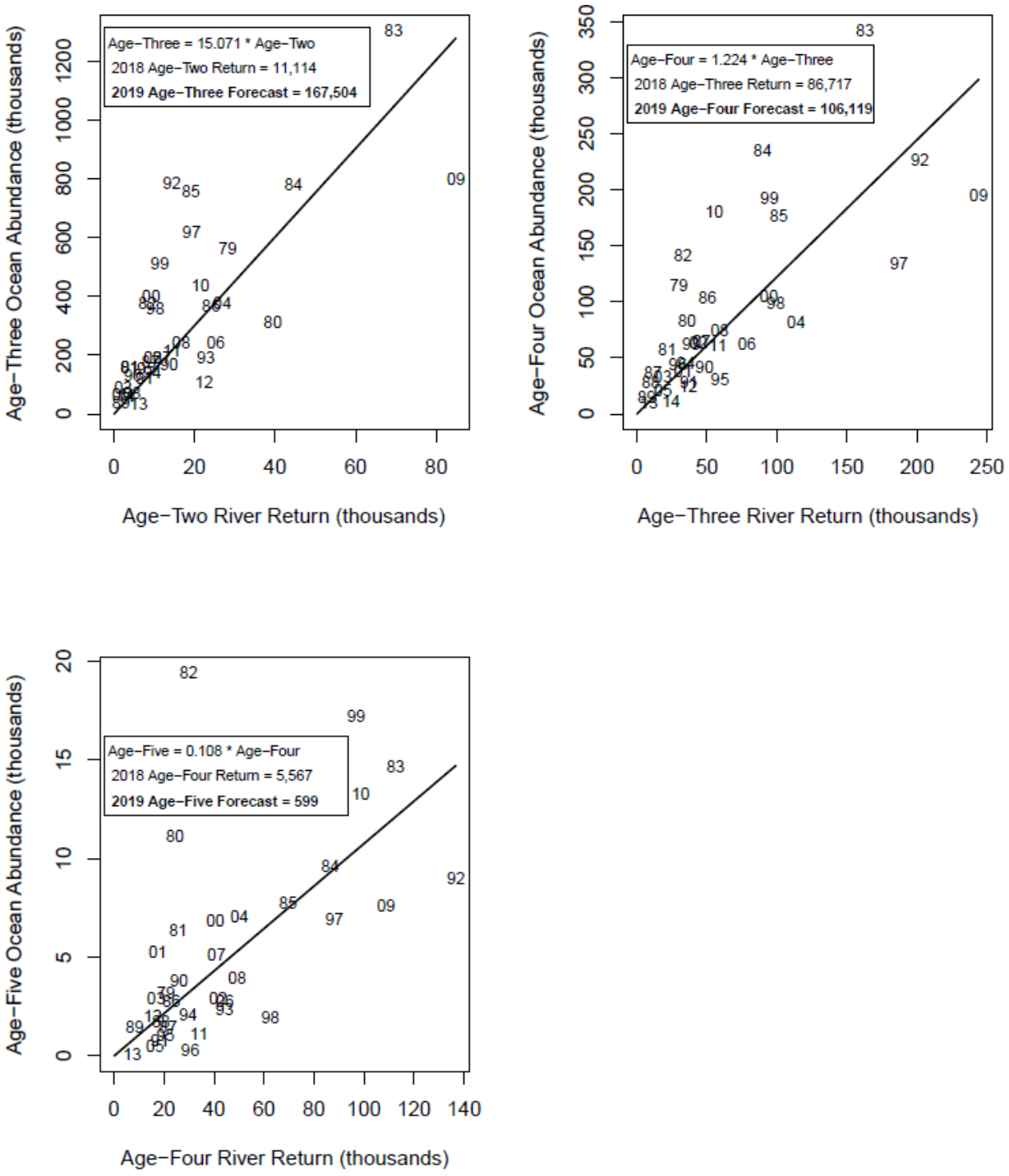

FIGURE II-3. Regression estimators for Klamath River fall Chinook ocean abundance (September 1) based on that year's river return of same cohort. Numbers in plots denote brood years.

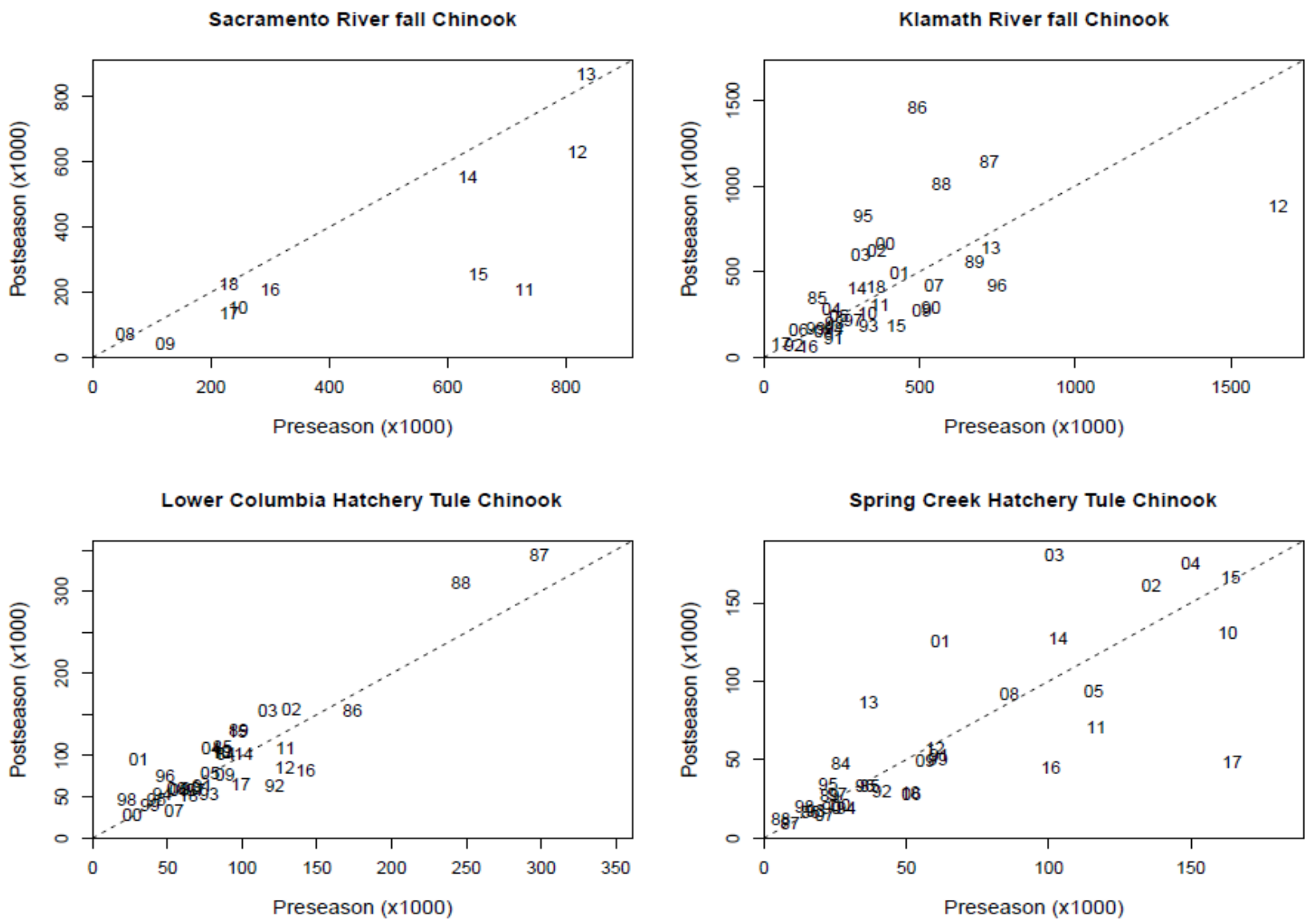

FIGURE II-4. Selected preseason vs. postseason forecasts for Chinook stocks with substantial contribution to Council area fisheries.

CHAPTER III - COHO SALMON ASSESSMENT

COLUMBIA RIVER AND OREGON/CALIFORNIA COAST COHO

OREGON PRODUCTION INDEX AREA

The majority of 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, and are divided into the following components: (1) public hatchery (OPIH), (2) Oregon coastal natural (OCN), including river and lake components, (3) Lower Columbia natural (LCN), and (4) natural and hatchery stocks south of Cape Blanco, Oregon, which include the Rogue, Klamath, and Northern California coastal stocks. Direct comparisons of 2019 abundance forecasts with recent year preseason abundance forecasts and postseason estimates are reported in Table III-1.

Beginning in 2008, a new method was developed to estimate coho abundances for both the natural and hatchery components of the Columbia River and the Oregon coast. The traditional method of stock abundance estimation used only catch data from Leadbetter Point, Washington, to the U.S./Mexico border. The assumption prior to 2008 was that OPI stocks that were caught north of the OPI area were balanced by northern stocks that were caught inside the OPI area. This assumption was valid as long as fisheries north and south were balanced. However, in recent years, fisheries to the south have been more restricted than those to the north, leading to underestimation of harvest of OPI area stocks. In addition, the estimation technique was not consistent with the methods used in Coho FRAM. The Mixed Stock Model (MSM) used for constructing the FRAM base period data was used to estimate the contribution of various coho stocks, including the OPI area stocks, to ocean fisheries and was based on CWT recoveries and associated tag rates. The MSM includes all fisheries that impact a particular stock, and therefore should provide a better overall accounting of total harvest and mortality of both Columbia River and Oregon coast coho stocks. The new run size estimates are based on the 1986-1997 base period and FRAM run reconstructions for more recent years. The Oregon Production Index Technical Team (OPITT) decided to use the MSM run reconstruction database for future accounting and forecasts. The MSM estimates were refined for use in 2009, with particular attention to the base period reconstruction for OCN coho. In 2010, the relationship between the MSM and previous time series was reconsidered. The changes in fishery effort patterns that resulted in biased harvest estimates began in the mid- to late-1990s, so the first few years of the MSM time series should be equivalent to the previous time series. This was used as justification to use the MSM data set as a continuation of the previous time series starting in 1986. In 2013, the OPI hatchery and OCN predictors used the longer, merged time series. This results in a higher level of statistical significance for the predictors and lower residuals in most recent years.

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 Basin, California, collectively produce fewer coho. Salmon Trout Enhancement Hatchery Coho Smolt Program (STEP) program releases were discontinued after the 2004 brood. OPI area smolt releases since 1960 are reported by geographic area in Appendix C, Table C-1.

There have been no Oregon coastal private hatchery coho (PRIH) smolt releases since 1990.

Predictor Description

Prior to 2008, the OPIH stock predictor was a multiple linear regression with the following variables: (1) Columbia River jacks (Jack CR), (2) Oregon coastal and Klamath River Basin jacks (Jack OC), and (3) a

correction term for the proportion of delayed smolts released from Columbia River hatcheries (Jack CR * [SmD/SmCR]).

In 2008, the stock predictor was modified slightly from that used in previous years. Because of the shorter data set (1986-2007 vs. 1970-2007) and the near-total phase-out of coastal coho salmon hatcheries, the factor for Oregon and California jacks (Jack OC) was not statistically significant in the regression. A simplified model with all OPI jacks combined into one term (Jack OPI) was used, and all parameters were statistically significant. In 2011, the longer (1970-2010) time series was used with the simplified model.

The OPIH stock predictor is partitioned into Columbia River early and late stocks based on the proportion of the 2018 jack returns of each stock adjusted for stock-specific maturation rates. The coastal hatchery stock is partitioned into northern and southern coastal stock components. The northern OPIH coastal stock is comprised of hatchery production from the central Oregon Coast. The southern OPIH coastal stock is comprised of hatchery production from the Rogue River basin in southern Oregon and the Klamath and Trinity basins in northern California. The 2018 partition was based on the proportion of the smolt releases in 2018.

For the 2019 abundance forecast, the database includes 1970-2017 recruits and 1969-2016 jack returns (in thousands of fish). The model was:

$$OPIH(t) = a (Jack\ OPI(t-1)) + b ((Jack\ CR(t-1) ([SmD(t-1)/SmCR(t-1)]) + c$$

Where:

a	=	19.25
b	=	27.43
c	=	-97.25
adjusted r^2	=	0.94

The OPIH stock data set and a definition of the above terms are presented in Appendix C, Table C-2.

Predictor Performance

Recent year OPIH stock preseason abundance forecasts partitioned by production area, stock, and as a total, are compared with postseason estimates in Table III-1. The 2018 preseason abundance prediction of 294,100 OPIH coho was about 2 times higher than the preliminary postseason estimate of 149,400 coho.

Since 1983, the OPIH predictor has performed well (Figure III-1a). The years with the highest variations were due principally to high interannual variability in the jack-to-adult ratios.

Stock Forecast and Status

Using the appropriate values from Appendix C, Table C-2, the OPIH abundance forecast for 2019 is 933,500 coho, 3.2 times higher than the 2018 prediction and 6.2 times higher than the preliminary 2018 postseason estimate.

Oregon Coastal Natural Coho

The OCN stock is composed of natural production north of Cape Blanco, Oregon from river (OCNR) and lake (OCNL) systems, which are forecasted independently.

Under the FMP, ESA consultation standards are used in place of ACLs for ESA-listed stocks like OCN (and Southern Oregon/Northern California (SONCC) and Central California Coho (CCC)) coho.

Predictor Description

Oregon Coastal Natural Rivers

Prior to 2010, a variety of methods were used to forecast OCNR coho abundance. Beginning in 2011, generalized additive models (GAMs) were used to relate OCNR recruitment to ocean environment indices. Nine variables were evaluated, ranging from indices of large-scale ocean patterns (e.g., Pacific Decadal Oscillation [PDO]) to local ecosystem variables (e.g., sea surface temperature at Charleston, OR). It was found that high explanatory power and promising forecast skill could be achieved when the mean May-July PDO averaged over the four years prior to the return year was used in combination with two other variables in a GAM. The multi-year average of the PDO, in essence, explains the lower frequency (multi-year) variability in recruitment, and can be viewed as a replacement of the Regime Index used previously. A final set of six models using six different environmental indices plus parent spawner abundance was chosen from the possible model combinations. When averaging the predictions from the set of models (the ensemble mean), a higher skill (in terms of variance explained or cross-validation) was achieved than by selecting any single model. Making multiple forecasts from a set of models also provides a range of possible outcomes that reflects, to some degree, the uncertainty in understanding how salmon productivity is driven by ocean conditions.

The GAM with 3 predictor variables can be expressed in the following general form:

$$\hat{Y} = f(X_1) + f(X_2) + f(X_3) + \varepsilon$$

Where $\hat{Y}$ is the prediction, X_1 through X_3 are the predictor variables, and ε is the deviation of $\hat{Y}$ from the observation Y. For the prediction, Y was the log-transformation of annual recruit abundance. The term f represents a smooth function, which in this case is a cubic spline.

The ensemble mean predictor used for the 2019 forecast was the geometric mean of the six GAM predictors:

Ensemble Mean of six forecasts based on environmental conditions and spawners.

Variables			Prediction	r^2	OCV[a/]
PDO	Spring Transition (Julian date; t-1)	Log Spawners (t-3)	67,525	0.65	0.56
PDO	Multivariate ENSO Index (Oct-Dec; t-1)	Upwelling (July-Sept; t-1)	67,001	0.68	0.59
PDO	Spring Transition (Julian date; t-1)	Multivariate ENSO Index (Oct-Dec; t-1)	63,031	0.68	0.60
PDO	Upwelling (July-Sept; t-1)	Sea Surface Temperature (May-Jul; t-1)	82,522	0.64	0.52
PDO	Sea Surface Height (Apr-June; t-1)	Upwelling (July-Sept; t-1)	95,194	0.68	0.55
PDO	Upwelling (Sept-Nov; t-1)	Sea Surface Temperature (Jan; t)	52,956	0.67	0.54
Ensemble Mean (90% prediction intervals)			70,097 (32,597-152,440)	0.74	0.61

a/ OCV – ordinary cross-validation score

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

Oregon Coastal Natural Lakes

Since 1988, except for 2008, 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 (Tenmile, Siltcoos, and Tahkenitch). Following the same reasoning used for the OCN Rivers predictor in 2008, OPITT chose to use the 2007 postseason abundance estimate of 10,000 coho for the 2008 preseason prediction instead of using the most recent three-year average. For 2019, OPITT chose to use the most recent three-year average adult stock abundance, which predicts 6,000 coho.

Predictor Performance

Recent year OCN preseason abundance predictions are compared to postseason estimates in Table III-1. The 2018 preseason abundance prediction of 54,900 OCN coho was 68 percent of the preliminary postseason estimate of 81,300 coho.

Stock Forecasts and Status

The 2019 preseason prediction for OCN (river and lake systems combined) is 76,100 coho, 39 percent higher than the 2018 preseason prediction and 94 percent of the 2018 postseason estimate (Table III-1). The 2019 preseason prediction for OCNR and OCNL components are 70,100 and 6,000 coho, respectively.

Based on parent escapement levels and observed OPI smolt-to-jack survival for 2016 brood OPI smolts, the total allowable OCN coho exploitation rate for 2019 fisheries is no greater than 15.0 percent under the Salmon FMP (Amendment 13) and no greater than 15.0 percent under the matrix developed by the OCN Coho Work Group during their review of Amendment 13 (Table V-8; Appendix A, Tables A-2 and A-3, respectively). The work group recommendation was accepted by the Council as expert biological advice in November 2000.

In November 2013, the Council approved a methodology change for a new marine survival index for the OCN coho harvest matrix that uses biological and oceanographic indicators for preseason planning beginning in 2014[1]. Based on this methodology, the marine survival index of 3.8 percent allows for a total allowable exploitation rate for 2019 fisheries that is no greater than 15.0 percent (Table V-8: Appendix Table A-4).

Lower Columbia River Natural

LCN coho consist of naturally produced coho mostly from Columbia River tributaries below Bonneville dam; however, coho produced in the upper Willamette are not part of the ESA-listed ESU and are not included in the LCN coho forecast. LCN coho were listed as endangered under the Oregon State ESA in 2002, and as threatened under the Federal ESA on June 28, 2005. Under the FMP, ESA consultation standards are used in place of ACLs for ESA-listed stocks like LCN coho.

Predictor Description

The 2019 predictions for the Oregon LCN coho populations are derived by the recent 2-year average abundances based on spawning ground counts. The 2019 adult abundance forecast for Oregon LCN coho is 8,800.

The 2019 predictions for the Washington LCN coho populations are derived by combining estimates of the 2016 brood year natural smolt production based on watershed area and the marine survival rate of 4.1 percent. The 2019 adult abundance forecast for Washington LCN coho is 28,100.

Predictor Performance

The LCN stock predictor methodology was developed in 2007. The preseason abundance compared to the postseason estimate is presented in Table III-1. The 2018 preseason abundance prediction of 21,900 LCN coho was lower than the preliminary postseason estimate of 29,700 coho.

[1] For additional information see the November 2013 PFMC Briefing Book, Agenda Item C.2.a, Attachment 1: Technical Revision to the OCN Coho Work Group Harvest Matrix.

Stock Forecast and Status

The 2019 prediction for LCN coho is 36,900 coho (Table III-1). This abundance estimate includes both Oregon and Washington LCN components.

NMFS ESA guidance for harvest of LCN coho in marine and mainstem Columbia River fisheries is based on a matrix describing parent escapement levels for multiple populations and the observed Columbia River OPI smolt-to-jack survival rate. Based on this matrix, the total allowable marine and mainstem Columbia River exploitation rate for LCN coho in 2019 fisheries would be no more than 23.0 percent.

Oregon Production Index Area Summary of 2018 Stock Forecasts

The 2019 combined OPI area stock abundance is predicted to be 1,009,600 coho, which is 2.89 times higher than the 2018 preseason prediction of 349,000 coho and 4.38 times higher than the 2018 preliminary postseason estimate of 230,700 coho. The historical OPI abundances are reported in Table III-2.

WASHINGTON COAST COHO

Washington coastal coho stocks include all natural and hatchery stocks originating in Washington coastal streams north of the Columbia River to the western Strait of Juan de Fuca (west of the Sekiu River). The stocks in this group most pertinent to ocean salmon fishery management are Willapa Bay (hatchery), Grays Harbor, Quinault (hatchery), Queets, Hoh, and Quillayute coho. These stocks contribute primarily to ocean fisheries off Washington and B.C.

A variety of preseason abundance estimators currently are employed for Washington coast and Puget Sound coho stocks, primarily based on smolt production and survival (Table I-2). These estimators are used to forecast preseason abundance of adult ocean (age-3) recruits.

A comparison was made of preseason ocean age-3 forecasts with postseason estimates derived from run reconstructions using FRAM ("Backwards" mode) to expand observed escapements to ocean abundance from CWT recovery data. It should be noted that forecast methodology has changed over time, and the overall trends and biases may not reflect the current methods.

Except for Willapa Bay, Washington Coast coho fall within an exception to the ACL requirements of the MSA because they are managed under an international agreement (the PST); therefore, specification of ACLs is not necessary for these stocks.

Willapa Bay

Predictor Description

The natural forecast was calculated using the 2016 brood year spawner escapements expanded by freshwater survival to calculate Willapa Bay smolt outmigrants. That value was then applied to a marine survival rate of 4.60 percent and corrected for a four-year average (2015-18) model performance. The terminal runsize was expanded to ocean age-3 using a recent four-year average exploitation rate (2015-2018) from the ocean fisheries.

The hatchery forecast is based on a terminal marine survival rate of 4.60 percent. This was applied to the 2016 brood year smolts released in the spring of 2018 to create a terminal runsize. The terminal runsize was expanded to ocean age-3 using a recent four-year average exploitation rate (2015-18) from the ocean fisheries.

The 4.60 percent terminal marine survival rate used for both natural and hatchery coho was calculated by averaging the results of a Willapa Bay jack to marine survival regression (5.46 percent) and Quinault Fisheries Department marine survival estimate of 3.73 percent ocean age 3.

Predictor Performance

There was no information available to evaluate performance of predictors for Willapa coho stocks.

Stock Forecasts and Status

The 2019 natural coho ocean age-3 abundance forecast is 63,448 compared to a 2018 preseason forecast of 20,645.

The 2019 Willapa Bay hatchery coho ocean age-3 abundance forecast is 94,019 compared to a 2018 preseason forecast of 44,542.

OFL, ABC, and ACL

The OFL, ABC, and ACL are defined in terms of spawner escapement (S_{OFL}, S_{ABC}, and S_{ACL}), and are calculated using potential spawner abundance forecasts and established exploitation rates. Potential Willapa Bay coho natural area spawner abundance was derived by adding the current forecast of natural coho ocean age-3 abundance to the predicted abundance of ocean age-3 hatchery origin coho spawning in natural areas. The abundance of ocean age-3 naturally spawning hatchery origin coho was calculated by multiplying the ocean age-3 hatchery coho abundance forecast by the most recent 3 year average proportion of hatchery origin returns that spawned naturally (.302), also known as stray rate. For Willapa Bay natural coho, $F_{MSY} = 0.74$, the value estimated from a stock-specific spawner-recruit analysis. The OFL for Willapa Bay natural coho is $S_{OFL} = 91{,}843 \times (1\text{-}0.74) = 23{,}879$. Because Willapa Bay natural coho are a Tier-1 stock, $F_{ABC} = F_{MSY} \times 0.95 = 0.70$, and $F_{ACL} = F_{ABC}$. The ABC for Willapa Bay natural coho is $S_{ABC} = 91{,}843 \times (1\text{-}0.70) = 27{,}553$, with $S_{ACL} = S_{ABC}$. These preseason estimates will be recalculated with postseason abundance estimates (when available) to assess ACL and OFL compliance.

Grays Harbor

Preseason abundance forecasts are made for natural fish throughout the system and for hatchery fish returning to three freshwater rearing complexes and three saltwater net-pen sites. The forecasts include fish originating from numerous volunteer production projects.

Predictor Description

The natural forecast is the sum of the Chehalis River natural, Humptulips River natural, and South Bay tributary natural forecasts. The Chehalis River coho forecast was developed by applying the Queets River natural coho January age-3 marine survival prediction to Grays Harbor coho smolt production estimate. The Grays Harbor coho smolt production estimate was developed by scaling the 2018 Queets River natural coho smolt production to the Chehalis River production based on the relationship between the Backward FRAM January age-3 ocean abundances of Queets and Chehalis natural Coho abundances. The Humptulips and South Bay tributary forecasts are based on recruit densities scaled from Clearwater and Chehalis basins, respectively.

The hatchery forecast is the sum of the Chehalis River, Humptulips River, and Grays Harbor net pen and off-site hatchery program hatchery-origin forecasts. The Chehalis River, Humptulips River, and Grays Harbor net-pen and off-site hatchery program hatchery-origin forecasts were based on recent 10 year average return/smolt rates (excluding two highest return rates) expanded to January age-3 recruits.

Predictor Performance

A comparison of preseason ocean age-3 forecasts with postseason estimates for Grays Harbor natural coho derived from FRAM run reconstruction indicated no notable bias. The 2017 forecast was higher than the 2017 postseason return estimate (Table III-3; Figure III-1).

Stock Forecasts and Status

The 2019 Grays Harbor natural ocean age-3 abundance forecast is 71,527, compared to a 2018 preseason forecast of 42,379. This ocean abundance results in classification of this stock's status as "Abundant" under the 2019 PST Southern Coho Management Plan (Table III-5).

The 2019 Grays Harbor hatchery coho ocean age-3 abundance forecast is 64,347, compared to a 2018 preseason forecast of 51,414.

OFL

The OFL is defined in terms of spawner escapement (S_{OFL}). For Grays Harbor natural coho MFMT = 0.65 and the OFL is S_{OFL} = 71,527 × (1-0.65) = 25,034. The preseason S_{OFL} will also be recalculated with postseason abundance estimates (when available) to assess OFL compliance.

Quinault River

Predictor Description

The natural forecast is based on a 3-year geometric mean of 2004, 2005 and 2015 recruits per spawner January Age-3 (JA3) abundance. These years are selected based on similar brood-year size.

The hatchery forecast is based on the smolt releases from the Quinault Cook Creek Hatchery (667,663) multiplied by the marine survival rate of 4.03 percent. The marine survival rate is based on the 10-year smolt to ocean age-3 survival (excluding 2009 and 2014). This is a lower marine survival rate than the 4.38 and 4.54 percent used in 2017 and 2018, respectively.

Predictor Performance

There was no information available to evaluate performance of predictors for these stocks.

Stock Forecasts and Status

The 2019 forecast for Quinault natural coho is 13,888 ocean age-3 recruits, a decrease from the 2018 forecast of 25,442.

The Quinault hatchery coho forecast is 26,904 ocean age-3 recruits. 100 percent of the hatchery smolts were marked with an adipose fin clip.

Queets River

Predictor Description

The natural coho forecast represents the estimated smolt outmigration multiplied by a projected marine survival rate of 4.60 percent to January age-3. The marine survival rate estimate is based on a model developed by Quinault Fisheries Department, which uses a relationship between survival to January age-3; specifically the mean Queets River flow in December of the smolt year and the maximum PDO value recorded from June through November of the smolt year (measured at 48N 125W). In 2018, an estimated 297,034 smolts emigrated from the Queets System.

The hatchery forecast is based on the smolt releases from 2018 (670,550) multiplied by a three-year average (2015-2017) marine survival rate of 1.96 percent. This is a lower marine survival rate than the 2.12 and 2.27 percent used in 2017 and 2018, respectively.

Predictor Performance

A comparison of preseason ocean age-3 forecasts with postseason estimates derived from FRAM run reconstruction indicated no persistent tendency to under- or over- predict abundance. The 2017 forecast was slightly lower than the postseason return estimate (Table III-3; Figure III-1).

Stock Forecasts and Status

The 2019 Queets natural coho forecast is 11,100 ocean age-3 recruits, an increase compared to the 2016, 2017 and 2018 forecast levels of 3,495, 6,548 and 6,964, respectively. This ocean abundance results in classification of this stock's status as "Abundant" under the 2019 PST Southern Coho Management Plan (Table III-5).

The 2018 Queets hatchery (Salmon River) coho forecast is 13,175 ocean age-3 recruits, an increase compared to the 2018 forecast of 10,814. Approximately 85 percent of the fish released from the Salmon River facility were marked with an adipose fin clip.

OFL

The OFL is defined in terms of spawner escapement (S_{OFL}). For Queets River coho, MFMT = 0.65, and the OFL is $S_{OFL} = 11{,}100 \times (1\text{-}0.65) = 3{,}885$. The preseason S_{OFL} value will be recalculated with postseason abundance estimates (when available) to assess OFL compliance.

Hoh River

Predictor Description

The natural coho forecast is based on estimated average smolt production per square mile of watershed from the Clearwater tributary which lies between the Queets River mainstem and the Hoh River. The Quinault Fisheries Department has a long-standing trapping program on the Clearwater River to estimate smolt production; it is assumed the two rivers produce smolts at a comparable rate per square mile of watershed (WDFW 2019). To estimate Hoh River production the Clearwater production of 591.37 smolts per square mile was multiplied by the size of the Hoh watershed (299 square miles), for a total of 176,820 coho smolts.

The total natural smolt production estimate was then multiplied by an expected marine survival rate of 4.85 percent. This is the same marine survival rate used to forecast 2019 Quillayute system and Strait of Juan de Fuca wild coho abundance, and is similar to the 4.60 percent survival to JA3 used in the Queets River. Each model used correlations between ocean indicators and January age-3 run sizes from prior years.

No hatchery production is projected for the Hoh system for 2019.

Predictor Performance

A comparison of preseason ocean age-3 forecasts with postseason estimates derived from FRAM run reconstruction indicated no persistent tendency to under- or over- predict abundance. The 2017 forecast was slightly higher than the postseason return estimate (Table III-3; Figure III-1).

Stock Forecasts and Status

The 2019 Hoh River natural coho forecast is 6,963 ocean age-3 recruits, an increase compared to the 2017 and 2018 forecasts of 6,198 and 5,816, respectively. This ocean abundance results in classification of this stock's status as "Abundant" under the 2019 PST Southern Coho Management Plan (Table III-5).

OFL

The OFL is defined in terms of spawner escapement (S_{OFL}). For Hoh River coho, MFMT = 0.65, and the OFL is S_{OFL} = 6,963 × (1-0.65) = 2,437. The preseason S_{OFL} value will be recalculated with postseason abundance estimates (when available) to assess OFL compliance.

Quillayute River

Quillayute River coho consist of a summer run that is managed primarily for hatchery production, and a fall run that is managed primarily for natural production. Quillayute River coho have both natural and hatchery components to both runs.

Predictor Description

The natural coho forecast is based on a scalar and average smolt production when the Quillayute system was trapped. The Clearwater River smolt production is used as a scalar to adjust the smolt production up or down from average production during the years the Bogachiel and Dickey Rivers were trapped, 1987-88, 1990, and 1992-94 respectively. The Quinault Fisheries Department has a long-standing trapping program on the Clearwater River to estimate smolt production.

In 2018, an estimated 119,905 smolts emigrated from the Dickey River and 284,009 smolts emigrated from the rest of the Quillayute system. The total freshwater production for the system is the sum of the two pieces, or 403,914 wild smolts. Separating these into summer and fall wild coho smolts by the relative number of spawners in brood year 2016 yields estimates of 29,977 wild summer coho smolts and 373,936 wild fall coho smolts.

Summer Coho

The summer natural coho forecast is based on the estimated total summer coho smolt production (29,977) and a projected marine survival rate of 4.85 percent. This is the same marine survival rate used to forecast Strait of Juan de Fuca wild coho abundance, and is similar to the 4.60 percent survival to JA3 used in the Queets River. It is a lower marine survival rate than the 5.10 and 4.88 percent used in 2017 and 2018, respectively.

An examination of the return rates of both hatchery releases and natural smolts indicate hatchery return rates are slightly below natural returns. Thus, for the hatchery component, a marine survival rate of 3.85 percent was selected. The survival rate of 3.85 percent was multiplied by a release of 109,666 smolts from the Sol Duc Hatchery.

Fall Coho

The forecast for the natural component was based on the estimated total fall coho smolt production (373,936) multiplied by an expected marine survival rate of 4.85 percent, the same as summer natural returns.

The fall hatchery production forecast was based on the same prediction of marine survival (3.85 percent) used for the summer hatchery coho forecast, multiplied by a release of 542,362 smolts.

Predictor Performance

A comparison of preseason ocean age-3 forecasts with postseason estimates for fall natural coho derived from FRAM run reconstruction indicated a tendency to over-predict actual run size. The 2017 Quillayute fall forecast was higher than the postseason return estimate (Table III-3; Figure III-1).

Stock Forecasts and Status

The 2019 Quillayute River summer natural and hatchery coho forecasts are 1,180 and 3,428 ocean age-3 recruits, respectively; 100 percent of the hatchery smolts were marked with an adipose fin clip. The 2019 forecast abundance of natural summer coho is lower than the 2018 forecast of 2,743.

The 2019 Quillayute River fall natural and hatchery coho forecasts are 14,724 and 16,953 ocean age-3 recruits, respectively. The 2019 forecast abundance of Quillayute fall natural and hatchery coho forecasts are higher than the respective 2018 forecasts of 10,557 and 16,505, respectively. The hatchery smolts were marked as follows: 392,140 (72.3 percent) adipose fin clip only; 75,195 (13.86 percent) adipose fin clip + CWT; and 75,027 (13,83 percent CWT only).

The ocean abundance forecast for Quillayute fall natural coho results in classification of the stock abundance as "Abundant" under the 2019 PST Southern Coho Management Plan (Table III-5).

North Washington Coast Independent Tributaries

Predictor Description

Production from several smaller rivers and streams along the North Washington Coast (Waatch River, Sooes River, Ozette River, Goodman Creek, Mosquito Creek, Cedar Creek, Kalaloch Creek, Raft River, Camp Creek, Duck Creek, Moclips River, Joe Creek, Copalis River, and Conner Creek), which flow directly into the Pacific Ocean, is forecast as an aggregate. Generally, stock assessment programs on these systems are minimal.

The 2019 forecast of natural coho production for these independent streams is based on a prediction of 500 smolts per square mile of watershed drainage, 424 square miles of watershed, and resulting in 212,000 smolts multiplied by an expected marine survival rate of 4.725 percent. The expected marine survival rate was developed by averaging the marine survival rate for Strait of Juan de Fuca natural coho, 4.85 percent, and the marine survival rate for Queets natural coho, 4.6 percent.

The 2019 hatchery forecast is based on the predicted marine survival of 7.77 percent for the brood year 2016 multiplied by brood year smolt release (198,161) into the Tsoo-Yess River from the Makah National Fish Hatchery. Ocean indicators suggest the 2016 brood encountered improving ocean conditions after migrating seaward in 2017. The forecast model predicts marine survival using the natural log of the brood's jack return rate. The jack return in 2018 was relatively high making up approximately 30% of the hatchery rack returns. The forecast model using the jack return rate predicted a marine survival rate of 7.77 percent.

Predictor Performance

There was no information available to evaluate performance of predictors for these stocks.

Stock Forecasts and Status

The 2019 forecast of natural coho production for these independent streams is 8,133 age-3 ocean recruits, compared to the 2018 preseason forecast of 4,144.

The 2019 hatchery forecast is 12,505 age-3 ocean recruits, compared to 7,891 age-3 recruits in 2018. All smolts released were marked with an adipose fin clip.

PUGET SOUND COHO STOCKS

Puget Sound coho salmon stocks include natural and hatchery stocks originating from U.S. tributaries in Puget Sound and the Strait of Juan de Fuca. The primary stocks in this group that are most pertinent to ocean salmon fishery management are Strait of Juan de Fuca, Hood Canal, Skagit, Stillaguamish, Snohomish, and South Puget Sound (hatchery) coho. These stocks contribute primarily to ocean fisheries off Washington and B.C.

A variety of preseason abundance estimators currently are employed for Puget Sound coho stocks, primarily based on smolt production and survival (Table I-2). These estimators are used to forecast preseason abundance of adult ocean age-3 recruits. Forecasts for natural Puget Sound coho stocks were generally derived by measured or predicted smolt production from each major watershed or region, multiplied by stock-specific marine survival rate predictions based on a jack return model from the WDFW Big Beef Creek Research Station in Hood Canal, natural coho CWT tagging programs at Baker Lake (Skagit River basin) and South Fork Skykomish River, adult recruits/smolt data generated from the WDFW Deschutes River Research Station, or other information. Puget Sound hatchery forecasts were generally the product of 2016 brood year (BY) smolt releases from each facility, and a predicted marine survival rate for each program. Hatchery marine survival rates were typically based on recent year average survival rates derived from CWT recovery information and/or run reconstructions.

The 2019 total Puget Sound region natural and hatchery coho ocean recruit forecast is 649,560, compared to a 2018 preseason forecast of 529,836. The 2019 natural forecast is 248,848, compared to the 2018 preseason forecast of 243,074. The 2019 hatchery forecast is 400,712, compared to the 2018 preseason forecast of 286,762.

A comparison was made of preseason ocean age-3 forecasts with postseason estimates derived from run reconstructions using FRAM ("Backwards" mode). This method expands observed escapements and actual catch to produce a FRAM estimate of post-season ocean abundance. This post-season FRAM estimate is dependent upon Base Period (1986-1992 fishing years) CWT recovery data. It should be noted that forecast methodology has changed over time, and the overall trends and biases may not reflect the current methods.

Puget Sound coho fall within an exception to the ACL requirements of the MSA because they are managed under an international agreement (the PST); therefore, specification of ACLs is not necessary for these stocks.

Strait of Juan de Fuca

Predictor Description

The natural forecast includes both Eastern and Western Strait of Juan de Fuca drainages. The forecast is based on a January age-3 ocean survival rate of 4.85 percent. The marine survival rate was predicted by a multiple linear regression model using two independent predictor variables: the natural log of the Elwha Hatchery coho jack return rate, and the PDO sum from May through September of the year preceding smolt outmigration. The marine survival rate was then applied to the coho smolt outmigration (223,939) to produce the forecast of January age-3 recruits and converted to ocean age-3.

Predictor Performance

A comparison of preseason ocean age-3 forecasts with postseason estimates derived from FRAM run reconstruction in recent years indicated no notable bias. The 2017 preseason forecast over-predicted the 2017 postseason estimate by a factor of 2.24 (Table III-4; Figure III-1b).

Stock Forecasts and Status

The 2019 Strait of Juan de Fuca natural ocean age-3 abundance forecast is 8,800 compared to the 2018 preseason forecast of 7,168.

The 2019 Strait of Juan de Fuca hatchery ocean age-3 abundance forecast is 16,846.

The preseason forecast of 8,800 age-3 ocean recruits places Strait of Juan de Fuca natural coho in the "Critical" category under the FMP and in the Low category under the PST. This results in an allowable total exploitation rate of no more than 20 percent under both the Council-adopted exploitation rate matrix (Appendix A, Table A-5) and the 2019 PST Southern Coho Management Plan (Table III-5).

OFL

The OFL is defined in terms of spawner escapement (S_{OFL}). For Strait of Juan de Fuca coho MFMT = 0.60, and the OFL is $S_{OFL} = 8,800 \times (1-0.60) = 3,520$. The preseason S_{OFL} value will be recalculated with postseason abundance estimates (when available) to assess OFL compliance.

Nooksack-Samish

Predictor Description

The natural coho forecast is the product of projected natural smolt production from each stream basin in the region, multiplied by stock-specific marine survival rate expectations.

The hatchery forecast is based on median marine survival rate expectations for Lummi Bay Hatchery or Skookum Hatchery multiplied by the number of smolts released.

Predictor Performance

There was no information available to evaluate performance of predictors for Nooksack-Samish coho stocks.

Stock Forecasts and Status

The 2019 Nooksack-Samish natural ocean age-3 abundance forecast is 25,133, compared to the 2018 preseason forecast of 20,574.

The 2019 Nooksack-Samish hatchery ocean age-3 abundance forecast is 59,790, compared to the 2018 preseason forecast of 61,256.

Skagit

Predictor Description

This natural forecast is based on weighted regression results of Saratoga Passage chlorophyll and light transmissivity in May, ONI in January - June, PDO in May – September and NPGO in May - September. The range of brood years used in this analysis was 1996 to 2014; brood years 1998 and 1999 were excluded because no Baker wild smolts were tagged in those years. The analysis produced an average marine survival of 3.88 percent; this was multiplied by the measured smolt production from the Skagit basin (49,075 Baker wild smolts and 1,444,051 Skagit wild smolts).

The hatchery forecast is based on weighted regression results of Saratoga Passage chlorophyll and light transmissivity in May, PDO in May - September and NPGO in May - September. Analysis of Marblemount Hatchery CWT recoveries for brood years 1996-2014 produced an average marine survival rate of 2.92

percent; this was multiplied by the total number of 2018 smolts released from all regional hatcheries (64,614 Baker marked hatchery smolts, 37,851 Marblemount unmarked hatchery smolts, and 237,149 Marblemount marked hatchery smolts).

Predictor Performance

A comparison of preseason ocean age-3 forecasts with postseason estimates derived from FRAM run reconstruction indicated a tendency to over-predict actual run size, especially early in the time series. The 2017 preseason forecast under-predicted the postseason estimate by a factor of .50 (Table III-4; Figure III-1b).

Stock Forecasts and Status

The 2019 Skagit natural ocean age-3 abundance forecast is 57,933, compared to the 2018 preseason forecast of 59,196.

The 2019 Skagit hatchery ocean age-3 abundance forecast is 9,917, compared to the 2018 preseason forecast of 13,101.

The preseason forecast of 57,933 age-3 ocean recruits places Skagit natural coho in the Low category under the FMP and in the Moderate category under the PST. This results in an allowable total exploitation rate of no more than 35 percent under both the Council adopted exploitation rate matrix (Appendix A, Table A-5) and the 2019 PST Southern Coho Management Plan (Table III-5).

OFL

The OFL is defined in terms of spawner escapement (S_{OFL}). For Skagit River coho, MFMT = 0.60 and the OFL is $S_{OFL} = 57{,}933 \times (1\text{-}0.60) = 23{,}173$. The preseason S_{OFL} value will be recalculated with postseason abundance estimates (when available) to assess OFL compliance.

Stillaguamish

Predictor Description

Regressing annual coho CPUE (total fish/total hours fished) against terminal run size one year later, generates a relationship that could be used to predict Stillaguamish adult returns. However, due to the high variability in marine survival (MS), coho smolt numbers at the trap are not a very precise predictor of adult returns one year later. Therefore, the Stillaguamish smolt trap CPUE was corrected with the South Fork Skykomish MS estimate for each brood and log transformed the data, which tightened the regression relationship with the terminal run.

The natural coho marine survival rate is 4.0 percent, which is below the long term average for the South Fork Skykomish (12.79 percent) and in consideration of ocean conditions to be similar, if not slightly worse, to 2018 returns. Due to consecutive years of low returns, discussion with the co-managers concluded that a MS of 4.0 percent is most risk-averse for harvest management purposes.

The Stillaguamish Hatchery released 57,060 marked and 6,765 unmarked yearlings in 2018, with an estimated 1,997 marked and 237 unmarked adults returning based on current a hatchery marine survival estimate of 3.5 percent.

Predictor Performance

A comparison of preseason ocean age-3 forecasts with postseason estimates derived from FRAM run reconstruction in recent years indicated no notable bias. The 2017 preseason forecast over-predicted the postseason estimate by a factor of 1.10 (Table III-4; Figure III-1b).

Stock Forecasts and Status

The 2019 Stillaguamish natural ocean age-3 abundance forecast is 23,820, compared to the 2018 preseason forecast of 18,950.

The 2019 Stillaguamish hatchery ocean age-3 abundance is 2,234, compared to the 2018 preseason forecast of less than 500.

The preseason forecast of 23,820 age-3 ocean recruits places Stillaguamish natural coho in the Normal category under the FMP and in the "Abundant" category under the PST. This results in an allowable total exploitation rate of no more than 50 percent under both the Council-adopted exploitation rate matrix (Appendix A, Table A-5) and the 2019 PST Southern Coho Management Plan (Table III-5).

OFL

The OFL is defined in terms of spawner escapement (S_{OFL}). For Stillaguamish coho, MFMT = 0.50 and the OFL is S_{OFL} = 23,820 × (1-0.50) = 11,910. The preseason S_{OFL} value will be recalculated with postseason abundance estimates (when available) to assess OFL compliance.

Snohomish

Predictor Description

The natural forecast is based on production of 2018 out-migrant smolts estimated from rotary screwtraps in the Skykomish and Snoqualmie rivers, and expanded to account for the "unsampled" spawning habitat downstream the traps and a 4.0 percent marine survival. The total smolt production estimate for the Snohomish watershed during 2018 is 1,565,000 smolts.

The hatchery forecast is based on 2018 hatchery releases of smolts from the WDFW Wallace River Hatchery, the Everett Net Pens, Eagle Creek and Tulalip Bernie Kai Kai Gobin Hatchery and a 3.5 percent marine survival.

Predictor Performance

A comparison of preseason ocean age-3 forecasts with postseason estimates derived from FRAM run reconstruction indicated no notable bias. The 2017 forecast over-estimated the postseason estimate by a factor of 4.64 (Table III-4; Figure III-1b).

Stock Forecasts and Status

The 2019 Snohomish natural ocean age-3 abundance forecast is 62,600, compared to the 2018 preseason forecast of 65,925.

The 2019 Snohomish hatchery ocean age-3 abundance forecast is 43,662, compared to the 2018 preseason forecast of 38,303.

The preseason forecast of 62,600 age-3 ocean recruits places Snohomish natural coho in the Low category under the FMP and in the Moderate category under the PST. This results in an allowable total exploitation

rate of no more than 40 percent under both the Council-adopted exploitation rate matrix (Appendix A, Table A-5) and the 2019 PST Southern Coho Management Plan (Table III-5).

OFL

The OFL is defined in terms of spawner escapement (S_{OFL}). For Snohomish coho, MFMT = 0.60 and the OFL is S_{OFL} = 62,600 × (1-0.60) = 25,054. The preseason S_{OFL} value will be recalculated with postseason abundance estimates (when available) to assess OFL compliance.

Hood Canal

Predictor Description

The natural forecast is based on a regression of CWT natural Big Beef Creek jacks on Hood Canal December age-2 recruits, using brood years 1983-1998 and 2002-2014 and converted to ocean age-3. The 1999-2001 broods were excluded because of the unusually high recruit-per-tagged jack ratio, which is not expected to occur this year. For 2019, as was done in the previous three years, the co-managers agreed to apply a bias correction for forecasting natural coho in Hood Canal.

The hatchery forecast is based on average cohort reconstruction-based December age-2 recruits/smolt for the six most recent available broods from each facility, applied to the 2016 brood smolt releases for each facility and converted to ocean age-3.

Predictor Performance

A comparison of preseason ocean age-3 forecasts with postseason estimates derived from FRAM run reconstruction indicated no notable bias. The 2017 preseason forecast over-predicted the postseason estimate by a factor of 3.32 (Table III-4; Figure III-1b).

Stock Forecasts and Status

The 2019 Hood Canal natural ocean age-3 abundance forecast is 40,140, compared to the 2018 preseason forecast of 59,530.

The 2019 Hood Canal hatchery ocean age-3 abundance forecast is 87,869, compared to the 2018 preseason forecast of 84,549.

The 2019 preseason forecast of 40,140 age-3 ocean recruits places Hood Canal natural coho in the Low category under the FMP and in the Moderate category under the PST. This results in an allowable total exploitation rate of no more than 45 percent under both the Council adopted exploitation rate matrix (Appendix A, Table A-5) and the 2019 PST Southern Coho Management Plan (Table III-5).

OFL

The OFL is defined in terms of spawner escapement (S_{OFL}). For Hood Canal coho MFMT = 0.65, and the OFL is S_{OFL} = 40,140 × (1-0.65) = 14,049. The preseason S_{OFL} value will be recalculated with postseason abundance estimates (when available) to assess OFL compliance.

South Sound

Predictor Description

The natural forecast is the product of projected smolt production from each of the stream basins in the region multiplied by a marine survival rate expectation for natural coho in the region. The upper South

Sound natural stocks' marine survival rate of 2.4 percent was based upon a recent year average smolt to adult ratio. The deep South Sound stocks' marine survival prediction of 2.8 percent also came from the methods of WDFW 2019 Wild Coho Forecast paper.

The hatchery forecast is the product of projected smolt production from each of the stream basins in the region multiplied by a marine survival rate expectation for hatchery coho in the region. The upper South Sound hatchery stocks' marine survival rate of 2.4 percent was based upon a recent year average smolt to adult ratio expanded to ocean age 3 using pre-terminal ERs from 2010 – 2017, excluding 2016. The deep South Sound stocks' marine survival prediction of 2.1 percent came from the South Sound recent year average.

Stock Forecasts and Status

The 2019 South Sound natural ocean age-3 abundance forecast is 30,422 compared to the 2018 preseason forecast of 15,034.

The 2019 South Sound hatchery ocean age-3 abundance forecast is 180,394, compared to the 2018 preseason forecast of 103,011.

STOCK STATUS DETERMINATION UPDATES

Queets River natural coho, Strait of Juan de Fuca natural coho, and Snohomish River natural coho were found to meet the criteria for being classified as overfished in the PFMC *Review of 2017 Ocean Salmon Fisheries*, released in February 2018. These three stocks remain overfished at the current time, based on escapement estimates detailed in the PFMC *Review of 2018 Ocean Salmon Fisheries*, released in February 2019.

SELECTIVE FISHERY CONSIDERATIONS FOR COHO

As the region has moved forward with mass marking of hatchery coho salmon stocks, selective fishing options have become an important consideration for fishery managers. Projected coho mark rates in Canadian, Puget Sound, and north Washington Coast fisheries are generally slightly higher than 2018 projections. Table III-6 summarizes projected 2019 mark rates for coho fisheries by month from Southern British Columbia, Canada to the Oregon Coast, based on preseason abundance forecasts.

TABLE III-1. Preliminary preseason and postseason coho stock abundance estimates for Oregon production index area stocks in thousands of fish. (Page 1 of 2)

	Columbia River Hatchery - Early Stock			Columbia River Hatchery - Late Stock			Lower Columbia River Natural (LCN)			**Oregon Coast Natural** (Rivers and Lakes)		
Year	Preseason	Postseason[a/]	Pre/Post season[a/]	Preseason	Postseason[a/]	Pre/Post season[a/]	Preseason	Postseason[a/]	Pre/Post season[a/]	Preseason	Postseason[a/]	Pre/Post season[a/]
1996	142.2	98.0	1.45	114.4	30.8	3.71				63.2	86.1	0.73
1997	206.9	129.8	1.59	86.5	53.7	1.61				86.4	27.8	3.11
1998	63.8	126.4	0.50	24.9	47.3	0.53				47.2	29.2	1.62
1999	325.5	174.9	1.86	140.9	120.7	1.17				60.7	51.9	1.17
2000	326.3	378.0	0.86	278.0	260.1	1.07				55.9	69.0	0.81
2001	1036.5	873.0	1.19	491.8	488.3	1.01				50.1	163.2	0.31
2002	161.6	324.7	0.50	143.5	271.8	0.53				71.8	304.5	0.24
2003	440.0	645.7	0.68	377.9	248.0	1.52				117.9	278.8	0.42
2004	313.6	389.0	0.81	274.7	203.0	1.35				150.9	197.0	0.77
2005	284.6	282.7	1.01	78.0	111.6	0.70				152.0	150.1	1.01
2006	245.8	251.4	0.98	113.8	156.3	0.73				60.8	116.4	0.52
2007	424.9	291.0	1.46	139.5	171.0	0.82	21.5	20.5	1.05	255.4	60.0	4.26
2008	110.3	333.9	0.33	86.4	207.6	0.42	13.4	28.7	0.47	60.0	170.9	0.35
2009	672.7	681.4	0.99	369.7	374.1	0.99	32.7	37.6	0.87	211.6	257.0	0.82
2010	245.3	274.3	0.89	144.2	263.6	0.55	15.1	53.2	0.28	148.0	266.8	0.55
2011	216.0	288.5	0.75	146.5	141.2	1.04	22.7	29.5	0.77	249.4	311.6	0.80
2012	229.8	114.7	2.00	87.4	55.6	1.57	30.1	12.9	2.33	291.0	123.8	2.35
2013	331.6	190.8	1.74	169.5	110.7	1.53	46.5	36.8	1.26	191.0	128.4	1.49
2014	526.6	760.5	0.69	437.5	480.3	0.91	33.4	108.7	0.31	230.6	403.3	0.57
2015	515.2	150.5	3.42	261.9	91.8	2.85	35.9	20.9	1.72	206.6	70.4	2.93
2016	153.7	127.0	1.21	226.9	96.1	2.36	40.0	25.1	1.59	152.7	83.2	1.84
2017	231.7	170.9	1.36	154.6	108.4	1.43	30.1	31.2	0.96	101.9	65.6	1.55
2018	164.7	82.7	1.99	121.5	64.6	1.88	21.9	29.7	0.74	54.9	81.3	0.68
2019	545.0	-	-	360.6	-	-	36.9	-	-	76.1	-	-

TABLE III-1. Preliminary preseason and postseason coho stock abundance estimates for Oregon production index area stocks in thousands of fish. (Page 2 of 2)

Year	Preseason	Postseason[a/]	Pre/Post season[a/]	Preseason	Postseason[a/]	Pre/Post season[a/]	Preseason	Postseason[a/]	Pre/Post season[a/]	Preseason	Postseason[a/]	Pre/Post season[a/]
	Salmon Trout Enhancement Program (STEP)[c/]			Oregon Coast North of Cape Blanco			California and Oregon Coast South of Cape Blanco			**Oregon Production Index Area Hatchery Total[b/]**		
1996	0.4	1.2	0.33	38.5	28.0	1.38	14.2	25.8	0.55	309.2	182.6	1.69
1997	1.3	0.3	4.33	60.4	19.0	3.18	22.3	12.8	1.74	376.1	215.3	1.75
1998	0.2	0.3	0.67	21.6	19.7	1.10	8.1	10.2	0.79	118.4	203.6	0.58
1999	0.7	0.4	1.75	59.4	14.4	4.13	33.4	9.6	3.48	559.2	319.6	1.75
2000	0.6	0.5	1.20	48.5	23.4	2.07	18.6	15.6	1.19	671.4	677.1	0.99
2001	1.0	1.4	0.71	127.3	46.9	2.71	52.0	46.0	1.13	1707.6	1454.2	1.17
2002	0.6	3.0	0.20	36.6	41.6	0.88	20.0	22.0	0.91	361.7	660.1	0.55
2003	3.6	3.6	1.00	29.3	34.5	0.85	15.9	24.3	0.65	863.1	952.5	0.91
2004	3.1	1.0	3.10	16.6	21.7	0.76	19.0	29.9	0.64	623.9	634.6	0.98
2005	1.0	0.4	2.50	11.5	10.7	1.07	15.8	38.1	0.41	389.9	443.1	0.88
2006	0.6	0.1	6.00	8.6	7.9	1.09	30.6	25.0	1.22	398.8	440.6	0.91
2007	0.2	0.0	-	7.0	1.3	5.38	22.2	13.2	1.68	593.6	476.5	1.25
2008				1.7	7.1	0.24	17.7	16.8	1.05	216.1	565.4	0.38
2009				7.3	7.5	0.97	23.4	3.1	7.55	1073.1	1066.2	1.01
2010				4.4	8.6	0.51	14.1	4.8	2.94	408.0	551.3	0.74
2011				3.6	3.6	1.00	9.0	9.0	1.00	375.1	442.3	0.85
2012				6.4	3.1	2.06	18.1	8.6	2.10	341.7	182.3	1.87
2013				5.6	5.7	0.98	18.7	7.6	2.46	525.4	316.9	1.66
2014				4.8	19.3	0.25	14.2	3.4	4.18	983.1	1263.6	0.78
2015				6.9	5.6	1.23	24.4	3.8	6.42	808.4	251.7	3.21
2016				5.5	9.3	0.59	10.4	1.5	6.93	396.5	233.8	1.70
2017				3.5	1.9	1.84	4.5	3.6	1.25	394.3	284.8	1.38
2018				3.3	1.1	3.00	4.6	1.0	4.60	294.1	149.4	1.97
2019				12.0	-	-	15.9	-	-	933.5	-	-

a/ Postseason estimates are based on preliminary data and not all stocks have been updated.

b/ LCN abundance is included as a subset of early/late hatchery abundance beginning in 2007. STEP estimates not included.

c/ Program was discontinued in 2005.

TABLE III-2. Oregon production index (OPI) area coho harvest impacts, spawning, abundance, and exploitation rate estimates in thousands of fish.[a/]

Year or Avg.	Ocean Fisheries[b/]		Oregon and California Coastal Returns			Columbia River Returns	Abundance[e/]	Ocean Exploitation Rate Based on OPI Abundance[f/]
	Troll	Sport	Hatcheries and Freshwater Harvest[c/]	OCN Spawners[d/]	Private Hatcheries			
1970-1975	1,629.6	558.4	45.8	55.2	-	460.4	2,749.3	0.80
1976-1980	1,253.6	555.0	31.2	31.1	26.1	263.3	2,154.2	0.85
1981-1985	451.2	274.0	37.2	56.0	176.8	305.3	1,328.6	0.63
1986-1990	574.6	339.3	55.1	45.5	154.3	705.0	1,602.2	0.70
1991-1995	107.4	182.7	46.6	53.2	35.1	315.1	668.4	0.35
1996	7.0	31.8	45.8	87.5	-	117.1	260.3	0.15
1997	5.5	22.4	27.9	31.6	-	156.4	230.5	0.12
1998	3.5	12.8	31.2	34.9	-	175.9	270.8	0.06
1999	3.6	36.5	23.4	48.6	-	289.1	432.0	0.09
2000	25.2	74.6	37.0	84.8	-	558.3	762.4	0.13
2001	38.1	216.8	75.7	174.7	-	1128.3	1,673.2	0.15
2002	15.0	118.7	53.9	266.9	-	535.8	972.2	0.14
2003	28.8	252.4	44.9	236.2	-	713.2	1,266.9	0.22
2004	26.2	159.3	38.1	197.3	-	463.5	904.5	0.21
2005	10.5	58.2	42.7	164.6	-	354.7	629.9	0.11
2006	4.5	47.5	29.5	132.7	-	409.7	674.1	0.08
2007	26.2	128.5	10.9	71.4	-	349.0	631.3	0.25
2008	0.6	26.4	16.0	180.1	-	520.8	769.8	0.04
2009	27.7	201.2	16.5	265.3	-	760.2	1,341.3	0.17
2010	5.8	48.8	18.5	287.1	-	466.5	848.4	0.06
2011	4.2	54.7	20.0	360.8	-	378.1	836.4	0.07
2012	4.7	45.5	18.5	104.6	-	152.4	311.3	0.16
2013	8.4	48.3	26.5	135.6	-	252.8	494.1	0.11
2014	35.6	197.4	42.0	362.1	-	1,019.5	1,724.8	0.14
2015	11.7	84.4	11.8	61.2	-	169.5	336.3	0.29
2016	2.8	31.7	11.4	82.2	-	205.0	334.8	0.10
2017	2.1	50.0	3.9	65.9	-	236.3	355.4	0.15
2018[g/]	1.5	53.8	3.0	79.4	-	138.4	232.4	0.24

a/ The OPI area includes ocean and inside harvest impacts and escapement to streams and lakes south of Leadbetter Pt., Washington.
b/ Includes estimated non-retention mortalities; troll: release mort.(1982-present) and drop-off mort.(all yrs.); sport: release mort.(1994-present) and drop-off mort.(all yrs.).
c/ Includes STEP smolt releases through the 2007 return year, after which the program was terminated.
d/ Includes Rogue River.
e/ FRAM post-season runs used after 1985 and includes OPI origin stock catches in all fisheries.
f/ Private hatchery stocks are excluded in calculating the OPI area stock aggregate ocean exploitation rate index.
g/ Preliminary.

TABLE III-3. Preseason forecasts and postseason estimates of ocean abundance for selected Washington coastal adult natural coho stocks in thousands of fish.

Year or Ave.	Preseason Forecast	Postseason Return	Pre/Post-season	Preseason Forecast	Postseason Return	Pre/Post-season	Preseason Forecast	Postseason Return	Pre/Post-season	Preseason Forecast	Postseason Return	Pre/Post-season
	Quillayute River Fall			**Hoh River**			**Queets River**			**Grays Harbor**[a/b/]		
1991-1995	15.4	16.2	1.07	7.1	8.5	1.32	11.9	14.0	1.2	122.8	68.0	2.2
1996	13.0	20.3	0.64	4.2	7.7	0.54	8.3	22.6	0.37	121.4	89.7	1.35
1997	8.9	5.8	1.53	2.8	4.1	0.68	4.3	2.2	1.92	26.1	20.2	1.29
1998	8.0	17.4	0.46	3.4	5.6	0.61	4.2	6.3	0.66	30.1	46.4	0.65
1999	14.5	16.1	0.90	3.2	6.8	0.47	4.3	8.6	0.50	57.7	42.7	1.35
2000	8.7	16.5	0.53	3.5	9.3	0.38	2.7	12.1	0.22	47.8	51.9	0.92
2001	23.0	28.4	0.81	8.5	16.2	0.52	12.0	35.8	0.33	51.3	103.2	0.50
2002	22.3	33.2	0.67	8.5	13.2	0.64	12.5	26.3	0.47	55.4	142.0	0.39
2003	24.9	22.5	1.11	12.5	8.7	1.44	24.0	15.7	1.52	58.0	108.4	0.54
2004	21.2	20.7	1.02	8.1	6.9	1.17	18.5	13.3	1.39	117.9	90.8	1.30
2005	18.6	20.9	0.89	7.6	8.2	0.93	17.1	11.9	1.43	91.1	65.9	1.38
2006	14.6	9.9	1.48	6.4	2.7	2.36	8.3	9.2	0.90	67.3	30.6	2.20
2007	10.8	10.7	1.01	5.4	5.8	0.93	13.6	7.1	1.92	59.4	34.6	1.72
2008	10.5	11.1	0.95	4.3	4.3	1.00	10.2	7.4	1.39	42.7	49.0	0.87
2009	19.3	15.5	1.24	9.5	9.5	1.00	31.4	16.0	1.97	59.2	104.6	0.57
2010	22.0	17.1	1.29	7.6	11.4	0.67	21.8	19.9	1.09	67.9	117.4	0.58
2011	28.2	13.3	2.11	11.6	13.0	0.89	13.3	15.1	0.88	89.1	86.2	1.03
2012	33.5	12.8	2.61	14.3	8.1	1.77	37.2	9.1	4.08	150.2	103.9	1.45
2013	17.2	15.8	1.09	8.6	9.2	0.94	24.5	9.9	2.48	196.8	80.3	2.45
2014	18.4	17.3	1.07	8.9	9.1	0.97	10.3	12.8	0.80	108.8	152.9	0.71
2015	10.5	4.8	2.19	5.1	2.9	1.74	7.5	2.7	2.75	142.6	31.7	4.50
2016	4.5	11.7	0.38	2.1	5.4	0.39	3.5	6.5	0.54	35.7	35.3	1.01
2017	15.8	12.9	1.22	6.2	6.0	1.03	6.5	6.8	0.96	50.0	37.3	1.34
2018	10.6	NA	NA	5.8	NA	NA	7.0	NA	NA	42.4	NA	NA
2019	14.7	-	-	7.0	-	-	11.1	-	-	71.5	-	-

a/ Coho FRAM was used to estimate post-season ocean abundance.

b/ In 1993 and 1994 preseason forecasts were a range of 144-153 and 53.8-60.2 respectively. The midpoint of each range was used in calculating the 1991-1995 average.

TABLE III-4. Preseason forecasts and postseason estimates of ocean abundance for selected Puget Sound adult natural coho stocks in thousands of fish[a/]. (Page 1 of 2)

Year or Ave.	Preseason Forecast[b/]	Postseason Return	Pre/Postseason	Preseason Forecast	Postseason Return	Pre/Postseason	Preseason Forecast	Postseason Return	Pre/Postseason
		Skagit River			**Stillaguamish River**			**Hood Canal**	
1991-1995	NA	82.0	-	53.6	18.1	3.74	94.2	14.2	6.63
1996	NA	48.3	-	51.6	12.5	4.13	25.1	37.2	0.67
1997	70.9	63.1	1.12	36.0	14.1	2.56	78.4	101.8	0.77
1998	55.0	95.1	0.58	47.8	31.1	1.54	108.0	118.5	0.91
1999	75.7	40.9	1.85	35.7	7.5	4.77	65.1	17.6	3.70
2000	30.2	95.2	0.32	17.7	31.2	0.57	61.0	39.7	1.54
2001	87.2	132.5	0.66	24.4	81.8	0.30	62.0	110.0	0.56
2002	98.5	71.8	1.37	19.7	30.4	0.65	34.9	81.0	0.43
2003	116.6	114.1	1.02	37.8	49.8	0.76	33.4	199.9	0.17
2004	155.8	145.3	1.07	38.0	73.9	0.51	98.7	219.7	0.45
2005	61.8	52.4	1.18	56.7	29.1	1.95	98.4	68.3	1.44
2006	106.6	11.5	9.25	45.0	11.8	3.81	59.4	49.7	1.20
2007	26.8	83.0	0.32	69.2	45.2	1.53	42.4	78.6	0.54
2008	61.4	35.5	1.73	31.0	15.3	2.03	30.4	25.8	1.18
2009	33.4	87.5	0.38	13.4	27.4	0.49	48.6	45.7	1.06
2010	95.9	64.6	1.48	25.9	16.8	1.55	33.2	14.5	2.29
2011	138.1	78.1	1.77	66.6	61.3	1.09	74.7	56.8	1.31
2012	48.3	139.1	0.35	47.5	60.6	0.78	73.4	125.5	0.58
2013	137.2	150.7	0.91	33.1	78.1	0.42	36.8	37.9	0.97
2014	112.4	51.7	2.17	32.5	49.1	0.66	82.8	69.6	1.19
2015	121.4	15.5	7.82	31.3	5.6	5.59	61.5	63.7	0.96
2016	8.9	44.7	0.20	2.8	15.6	0.18	35.3	31.8	1.11
2017	11.2	22.3	0.50	7.6	6.9	1.10	115.6	35.0	3.31
2018	59.2	NA	NA	19.0	NA	NA	59.5	NA	NA
2019	57.9	-	-	23.8	-	-	40.1	-	-

TABLE III-4. Preseason and postseason estimates of ocean abundance for selected Puget Sound adult natural coho stocks in thousands of fish[a/]. (Page 2 of 2)

Year or Ave.	Preseason Forecast	Postseason Return	Pre/Postseason	Preseason Forecast	Postseason Return	Pre/Postseason
		Snohomish			**Strait of Juan de Fuca**	
1991-1995	341.6	200.6	1.85	20.6	19.3	1.22
1996	338.1	132.3	2.55	10.7	19.4	0.55
1997	186.6	106.4	1.75	6.5	20.3	0.32
1998	165.3	193.9	0.85	16.8	21.0	0.80
1999	141.6	82.2	1.72	14.7	9.9	1.48
2000	53.0	154.6	0.34	13.5	28.6	0.47
2001	129.6	360.1	0.36	21.4	43.9	0.49
2002	123.1	185.5	0.66	21.3	26.3	0.81
2003	203.0	198.0	1.03	25.6	22.9	1.12
2004	192.1	287.9	0.67	35.7	23.8	1.50
2005	241.6	133.4	1.81	20.7	12.5	1.66
2006	139.5	94.2	1.48	26.1	4.6	5.65
2007	98.9	156.4	0.63	29.9	10.2	2.92
2008	92.0	49.5	1.86	24.1	3.9	6.25
2009	67.0	133.4	0.50	20.5	24.7	0.83
2010	99.4	54.4	1.83	8.5	20.1	0.42
2011	180.0	137.4	1.31	12.3	11.7	1.05
2012	109.0	175.8	0.62	12.6	12.5	1.01
2013	163.8	176.0	0.93	12.6	9.8	1.29
2014	150.0	66.6	2.25	12.5	13.8	0.91
2015	151.5	28.3	5.35	11.1	4.7	2.36
2016	20.6	54.1	0.38	4.4	8.7	0.51
2017	107.3	23.2	4.63	13.1	5.9	2.24
2018	65.9	NA	NA	7.2	NA	NA
2019	62.6	-	-	8.8	-	-

a/ Coho FRAM was used to estimate post season ocean abundance.

b/ Preseason forecasts in 1986-1996 were based on accounting system that signficantly underestimated escapement and are not comparable to post season.

TABLE III-5. Status categories and constraints for Puget Sound and Washington Coast coho under the FMP and PST Southern Coho Management Plan.

FMP

FMP Stock	Total Exploitation Rate Constraint[a/]	Categorical Status[a/]
Skagit	35%	Low
Stillaguamish	50%	Normal
Snohomish	40%	Low
Hood Canal	45%	Low
Strait of Juan de Fuca	20%	Critical
Quillayute Fall	59%	
Hoh	65%	
Queets	65%	
Grays Harbor	65%	

PST Southern Coho Management Plan

U.S. Management Unit	Total Exploitation Rate Constraint[b/]	Categorical Status[c/]
Skagit	35%	Moderate
Stillaguamish	50%	Abundant
Snohomish	40%	Moderate
Hood Canal	45%	Moderate
Strait of Juan de Fuca	20%	Low
Quillayute Fall[c/]	57%	Abundant
Hoh[c/]	71%	Abundant
Queets[c/]	48%	Abundant
Grays Harbor	51%	Abundant

a/ Preliminary. For Puget Sound stocks, the exploitation rate constraints and categorical status (Normal, Low, Critical) reflect application of Comprehensive Coho Agreement rules, as adopted in the FMP. For Washington Coast stocks, exploitation rate constraints represent MFMT. Note that under *U.S. v. Washington* and *Hoh v. Baldrige* case law, the management objectives can differ from FMP objectives provided there is an annual agreement among the state and tribal comanagers; therefore, the exploitation rates used to report categorical status do not necessarily represent maximum allowable rates for these stocks.

b/ Preliminary. For Puget Sound and Washington Coast management units, the exploitation rate constraints reflect application of the 2019 PST Southern Coho Management Plan.

c/ Categories (Abundant, Moderate, Low) correspond to the general exploitation rate ranges depicted in paragraph 8(b)(iii) of the 2019 PST Southern Coho Management Plan. For Washington Coast stocks, categorical status is determined by the exploitation rate associated with meeting the escapement goal (or the lower end of the escapement goal range). This also becomes the maximum allowable rate unless the stock is in the "Low" status. In that case, an ER of up to 20% is allowed.

TABLE III-6. Projected coho mark rates for 2019 U.S. forecasts under base period fishing patterns (percent marked).

Area	Fishery	June	July	August	Sept
Canada					
Johnstone Strait	Recreational	-	47%	42%	-
West Coast Vancouver Island	Recreational	58%	47%	58%	62%
North Georgia Strait	Recreational	58%	59%	59%	57%
South Georgia Strait	Recreational	42%	61%	53%	59%
Juan de Fuca Strait	Recreational	59%	58%	60%	55%
Johnstone Strait	Troll	65%	60%	45%	56%
NW Vancouver Island	Troll	51%	48%	45%	40%
SW Vancouver Island	Troll	49%	52%	51%	55%
Georgia Strait	Troll	62%	61%	62%	58%
Puget Sound					
Strait of Juan de Fuca (Area 5)	Recreational	67%	61%	58%	60%
Strait of Juan de Fuca (Area 6)	Recreational	67%	59%	60%	56%
San Juan Island (Area 7)	Recreational	47%	60%	56%	45%
North Puget Sound (Areas 6 & 7A)	Net	-	67%	57%	50%
Council Area					
Neah Bay (Area 4/4B)	Recreational	47%	63%	57%	63%
LaPush (Area 3)	Recreational	70%	64%	73%	59%
Westport (Area 2)	Recreational	77%	72%	67%	66%
Columbia River (Area 1)	Recreational	81%	81%	74%	77%
Tillamook	Recreational	72%	66%	64%	65%
Newport	Recreational	68%	64%	63%	55%
Coos Bay	Recreational	65%	62%	57%	48%
Brookings	Recreational	62%	51%	45%	17%
Neah Bay (Area 4/4B)	Troll	54%	59%	58%	62%
LaPush (Area 3)	Troll	48%	59%	59%	62%
Westport (Area 2)	Troll	66%	63%	64%	59%
Columbia River (Area 1)	Troll	75%	74%	70%	65%
Tillamook	Troll	62%	62%	67%	61%
Newport	Troll	64%	62%	63%	63%
Coos Bay	Troll	64%	62%	59%	48%
Brookings	Troll	57%	54%	57%	66%
Columbia River					
Buoy 10	Recreational	-	-	-	71%

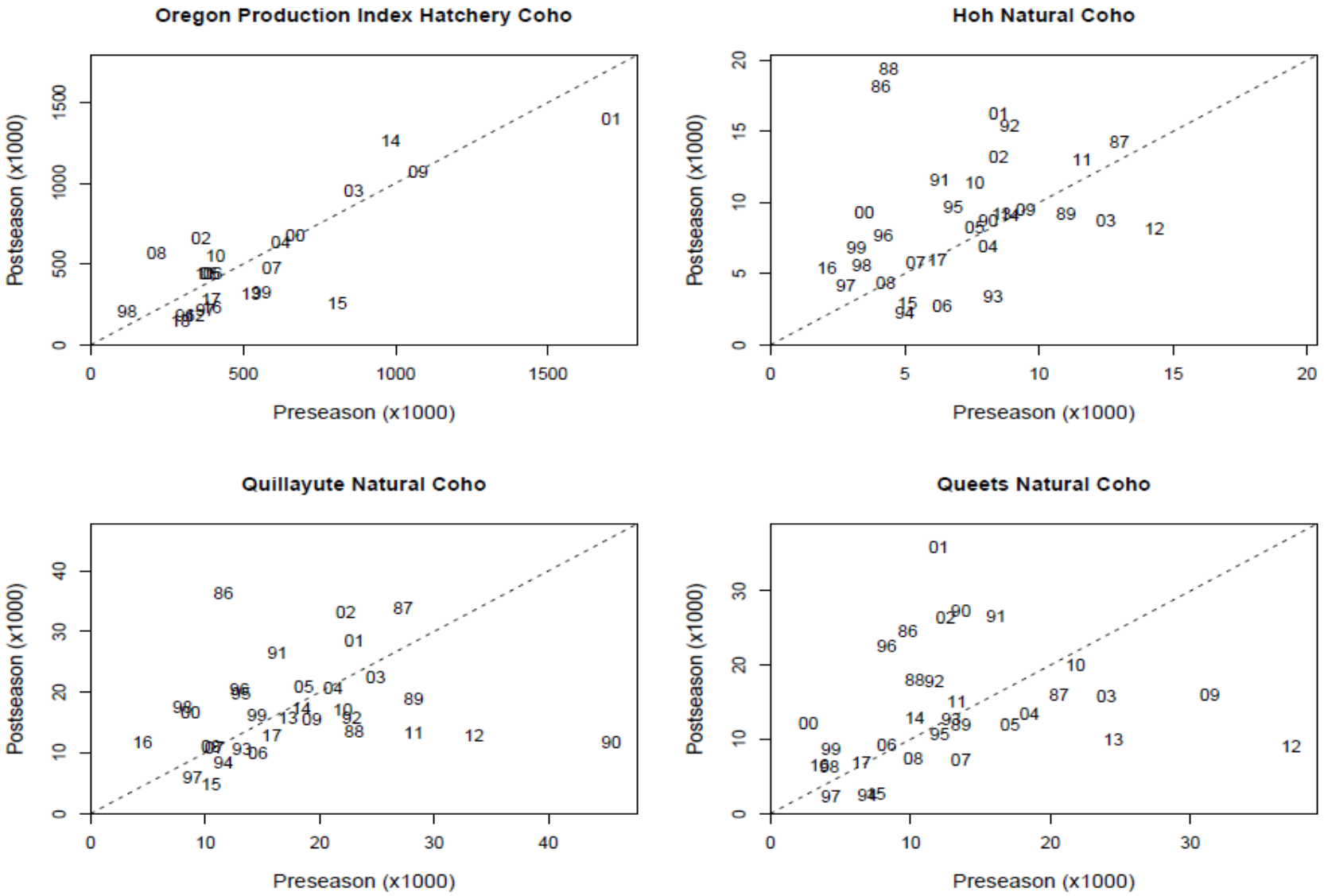

FIGURE III-1a. Selected preseason vs. postseason forecasts for coho stocks with substantial contribution to Council area fisheries.

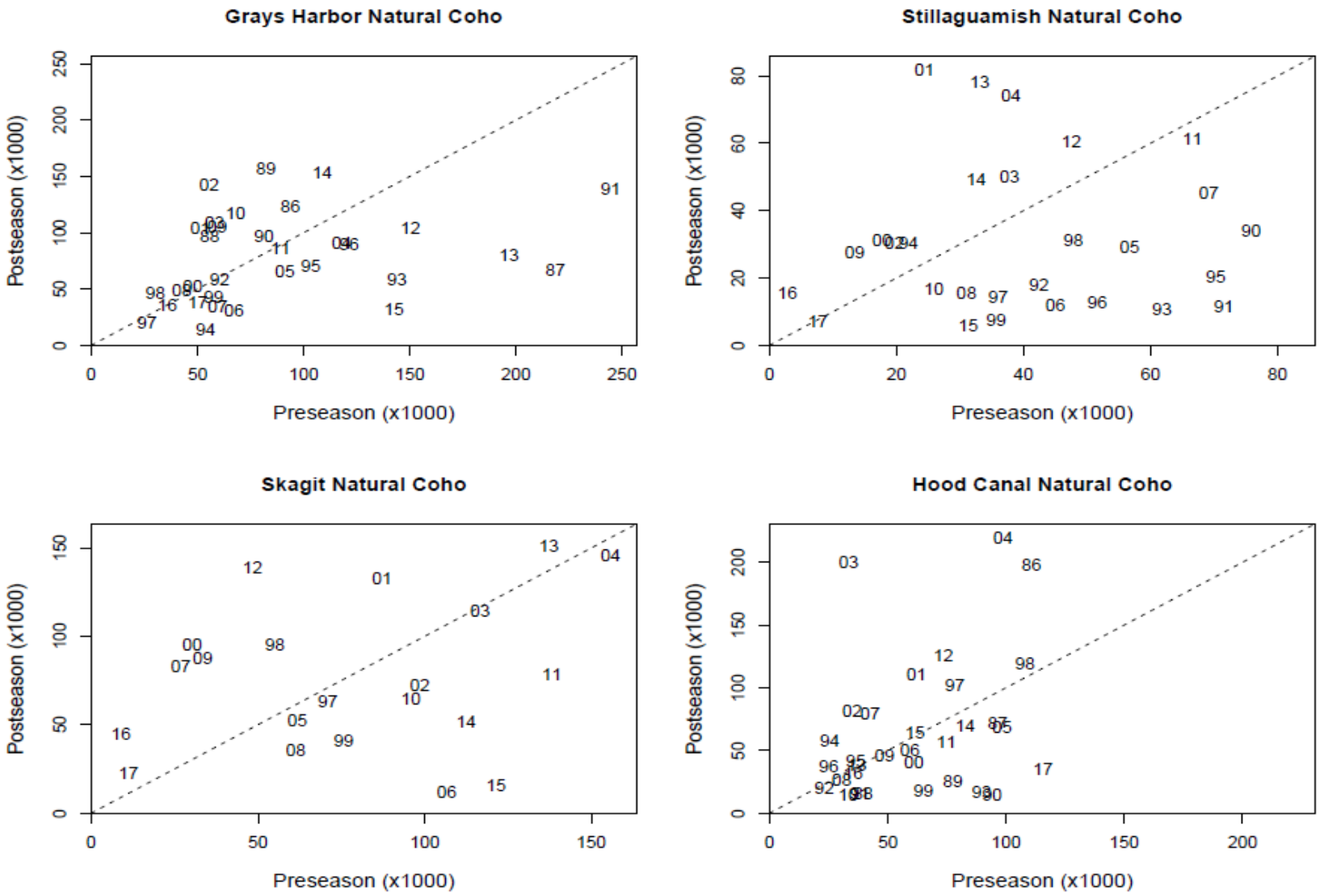

FIGURE III-1b. Selected preseason vs. postseason forecasts for coho stocks with substantial contribution to Council area fisheries.

CHAPTER IV: AFFECTED ENVIRONMENT - PINK SALMON ASSESSMENT

Two major runs comprise the pink salmon population available to Council fisheries during odd-numbered years: the Puget Sound run and the Fraser River (British Columbia) run, which is more abundant of the two runs. The 2017 pink salmon runsize forecasts included 1.15 million for Puget Sound and 8.69 million for Fraser River. The 2017 actual run sizes included 510,857 for Puget Sound and 3.62 million for Fraser River. The Puget Sound runsize was the fifth lowest in the time series from 1959-2018 and lowest since 1997. The Fraser River run size represented 42 percent of the pre-season forecast. The 2019 run size forecasts include 608,388 Puget Sound pink salmon and 5.02 million Fraser River pink salmon (Table IV-1).

TABLE IV-1. Estimated annual (odd-numbered years) run sizes and forecasts for Fraser River and Puget Sound pink salmon in millions of fish.

	Puget Sound		Fraser River[a/]	
Year	Forecast	Actual	Forecast	Actual
1977	NA	0.88	NA	8.21
1979	NA	1.32	NA	14.40
1981	NA	0.50	NA	18.69
1983	NA	1.01	NA	15.35
1985	NA	1.76	NA	19.10
1987	NA	1.57	NA	7.17
1989	NA	1.93	NA	16.63
1991	NA	1.09	NA	22.18
1993	NA	1.06	NA	16.98
1995	3.4	2.08	NA	12.90
1997	NA	0.44	11.40	8.18
1999	NA	0.96	NA	3.59
2001	2.92	3.56	5.47	21.17
2003	2.32	2.90	17.30	26.00
2005	1.98	1.23	16.30	10.00
2007	3.34	2.45	19.60	11.00
2009	5.16	9.84	17.54	19.50
2011	5.98	5.27	17.50	20.65
2013	6.27	8.75	8.93	15.90
2015	6.76	3.70	14.50	5.78
2017	1.15	0.51	8.69	3.62
2019[b/]	0.61	NA	5.02	NA

a/ Total run size.

b/ Preliminary forecast.

CHAPTER V: DESCRIPTION AND ANALYSIS OF THE NO-ACTION ALTERNATIVE

The No-Action Alternative consists of the preseason management measures adopted by the Council and approved by the Secretary of Commerce for the 2018 ocean salmon season between the U.S./Canada border and the U.S./Mexico border. The management measures relate to three fishery sectors: non-Indian commercial (Table V-1), recreational (Table V-2), and treaty Indian (Table V-3). A description of the 2018 preseason management measures and analyses of their projected effects on the biological and socioeconomic environment are presented in Preseason Report III (PFMC 2018c). A description of the 2018 management measures as implemented, including inseason modifications, and an analysis of their effects on the environment, including a historical perspective, is presented in the SAFE document - Review of 2018 Ocean Salmon Fisheries (PFMC 2019).

ANALYSIS OF EFFECTS ON THE ENVIRONMENT OF THE NO-ACTION ALTERNATIVE

Overview

Table V-4 provides a summary of Salmon FMP stock spawning escapement and exploitation rate projections for 2019 under the No-Action Alternative (2018 regulations), as well as postseason estimates of these quantities for earlier years, which are compared to FMP conservation objectives. For some stocks, postseason estimates of these metrics were either incomplete or unavailable when the Review of 2018 Ocean Salmon Fisheries was published. A preliminary determination of stock status under the FMP Status Determination Criteria (SDC) was available for some of these stocks in time for this report; however, some estimates remain unavailable. The STT will report to the Council on the status of stocks at the March 2019 Council meeting, and may further update the status of stocks present in Table V-4 at that time.

Chinook escapements and fishery impacts were forecast using the Sacramento Harvest Model, the Winter Run Harvest Model, and the Klamath Ocean Harvest Model for SRFC, SRWC, and KRFC, respectively. Assessment of effects under the No-Action Alternative for Oregon Coast Chinook are not available. Columbia River Chinook stock assessments were based on qualitative assessment of the magnitude of forecasts, if available, in relation to escapement goals.

Coho escapements and fishery impacts were estimated using Coho FRAM. Abundance forecasts for 2019 were updated for Washington and Oregon stocks, but forecasts for Canadian stocks are unchanged from those employed for 2018 planning. Updated forecasts for Canadian stocks are expected to become available in March 2019. To provide information on the effect of changes in abundance forecasts, the final 2018 pre-season regulatory package for ocean and inside fisheries was applied to 2019 projections of abundance.

Sacramento River Fall Chinook

A repeat of 2018 regulations would be expected to result in an escapement of 230,486 hatchery and natural area SRFC adults. This projection is higher than the minimum escapement level specified by the control rule for 2019 (122,000), S_{MSY} (122,000), and the 2019 preseason S_{ACL} (113,890; Tables V-4 and V-5). The geometric mean of the 2017 and 2018 spawning escapement estimates and the 2019 forecast spawning escapement under the No-Action Alternative is greater than the MSST, yet lower than S_{MSY} (Table V-4). The predicted SRFC exploitation rate under the No-Action Alternative is 39.3 percent, which is below the MFMT (78.0 percent; Table V-4) and the maximum allowable rate specified by the control rule for 2019 (67.9 percent). If the ocean fisheries were closed from January through August 2019 between Cape Falcon and the U.S./Mexico border, and Sacramento Basin fisheries were closed in 2019, the expected number of hatchery and natural area adult spawners would be 365,710.

The 2018 estimate of SRFC adult escapement was 105,739, which exceeds the 2018 postseason S_{ACL} of 67,156 (Table V-5).

Sacramento River Winter Chinook

A repeat of 2018 regulations would be expected to result in an age-3 impact rate of 9.1 percent for the area south of Point Arena, California. The 2019 forecast age-3 impact rate under the No-Action Alternative is lower than the 2019 maximum allowable rate of 15.7 percent.

Klamath River Fall Chinook

A repeat of 2018 regulations, which included a river recreational harvest allocation of 19.3 percent of the non-tribal harvest and a tribal allocation of 50 percent of the overall adult harvest, would be expected to result in 58,729 natural area adult spawners. This projection is greater than the minimum escapement level specified by the control rule for 2019 (40,700), S_{MSY} (40,700), and the 2019 preseason S_{ACL} (28,126; Tables V-4 and V-5). The geometric mean of the 2017 and 2018 natural area adult spawner escapement estimates and the 2019 forecast spawning escapement under the No-Action Alternative is greater than the MSST, yet lower than S_{MSY} (Table V-4). The predicted KRFC exploitation rate under the No-Action Alternative is 33.2 percent, which is lower than the MFMT (71.0 percent; Table V-4) and the maximum allowable rate specified by the control rule for 2019 (53.7 percent). If the ocean fisheries were closed from January through August 2019 between Cape Falcon and Point Sur, and the Klamath Basin fisheries (tribal and recreational) were closed in 2019, the expected number of natural area adult spawners would be 87,768.

The 2018 estimate of KRFC escapement was 53,624 natural area adults, which exceeds the 2018 postseason S_{ACL} of 23,794 (Table V-5).

California Coastal Chinook Stocks

The NMFS ESA consultation standard restricts the KRFC age-4 ocean harvest rate to no more than 16.0 percent to limit impacts on these stocks. The postseason estimate of this rate for 2018 is 22.6 percent. Applying 2018 regulations to the 2019 KRFC abundance results in an age-4 ocean harvest rate forecast of 10.2 percent. If the ocean fisheries were closed from January through August 2019 between Cape Falcon and Point Sur, the expected age-4 ocean harvest rate would be 0.2 percent (160 age-4 KRFC were harvested during the September through November 2018 period).

Oregon Coast Chinook Stocks

The FMP conservation objective for the northern and central Oregon coast Chinook stock complexes is based on a total goal of 150,000 to 200,000 natural adult spawners. For these two stock complexes attainment of goals are assessed using peak spawner counts observed in standard index reaches for the respective complexes. For the southern Oregon coast Chinook stock complex, the FMP conservation objective is assessed using the escapement estimate at Huntley Park on the Rogue River. Forecasts are not available for all of these stocks, but given recent trends, the escapement goals would likely be met again in 2019 under 2018 fishing seasons.

Columbia River Chinook Stocks

The 2019 forecasts for Columbia River spring and summer stocks are less than the 2018 forecasts. Most 2019 forecasts for tule and bright fall Chinook are less than the 2018 forecasts, but the 2019 forecasts for Lower River Wild and Mid-Columbia Brights are higher than the 2018 forecasts. Despite these reduced forecasts in 2019 from 2018, applying 2018 regulations to the forecasted 2019 abundance of Columbia River Chinook would result in ocean escapements meeting spawning escapement goals for all summer and fall Chinook stocks (Table V-4).

Washington Coast and Puget Sound Chinook Stocks

Council fisheries north of Cape Falcon have a negligible impact on Washington coast Chinook stocks and a minor impact on stocks that originate in Puget Sound. These stocks have northerly marine distribution

patterns, and are therefore impacted primarily by Canadian and Alaskan fisheries. An evaluation of 2018 Council area management measures on projected 2019 abundance would not provide a useful comparison of fishery impacts in relation to conservation objectives.

Oregon Production Index Area Coho Stocks

Ocean fisheries were modeled with 2018 Council regulations and 2018 regulations for non-Council area fisheries. Because of the increase in forecasts for most hatchery coho stocks in 2019 relative to the forecasts in 2018, this model run shows lower fishery impact rates. Due to the changes in the forecasts, the model run shows fishery impact rate decreases for OCN coho, LCN coho, and RK coho. This provides some indication of the fishery impacts and fisheries planning relative to the conservation objectives in 2019. Under this scenario, the expected escapement is 71,600 for OCN coho (Table V-6). For Columbia River hatchery coho stocks, the predicted ocean exploitation rate (excluding Buoy 10) is 9.8 percent on the Columbia River early stock and 12.5 percent on the Columbia River late stock; total predicted exploitation rates are 42.2 percent and 26.4 percent for early and late stock respectively. Predicted ocean escapements (after Buoy 10) into the Columbia River in 2019 show that under 2018 ocean regulations, Columbia River early and late coho would be expected to meet egg take goals.

As noted in Chapter III, the total allowable OCN coho exploitation rate for 2019 fisheries is no greater than 15.0 percent in the revised OCN coho matrix (Table V-8; Appendix A, Table A-4), and the total allowable RK hatchery coho marine exploitation rate is 13.0 percent (NMFS ESA consultation standard). Under 2018 fishery regulations and 2019 abundance forecasts, these exploitation rates are predicted to be 6.1 percent for OCN, and 2.4 percent (marine) for RK coho (Table V-7). The 2019 allowable LCN coho exploitation rate is expected to be 23.0 percent in the marine area and mainstem Columbia River fisheries combined pending NMFS ESA guidance. Under 2018 fishery regulations and 2019 abundance forecasts, the exploitation rate is predicted to be 4.0 percent for marine fisheries (excluding the Buoy 10 fishery) using combined unmarked Columbia River hatchery stocks as the proxy. The LCN coho exploitation rate estimate for the Buoy 10 fishery would be 0.7 percent and the estimated exploitation rate in freshwater fisheries would be 3.9 percent. The total exploitation rate on LCN coho would be 8.6 percent, less than the assumed 23.0 percent allowable rate.

Washington Coast, Puget Sound, and Canadian Coho Stocks

Exploitation rate and ocean escapement expectations in relation to management goals for selected naturally-spawning coho stocks, given 2019 preseason abundance forecasts and 2018 preseason projections for fishing patterns, are presented in Table V-6. The 2019 forecasts for Canadian coho stocks are not available, but are assumed to be at 2018 levels for this analysis. More detailed fishery management goals for Council area coho stocks are listed in Appendix A.

Under 2018 regulations, 2019 exploitation rates are expected to meet FMP conservation objectives applicable for 2019 for all Puget Sound coho stocks except Hood Canal. Ocean abundance forecasts for all Washington Coast natural coho stocks are above FMP spawning escapement conservation objectives. Management objectives for U.S. Puget Sound stocks subject to the PSC agreement are identical to FMP objectives and would be met under 2018 regulations for all Puget Sound stocks except Hood Canal; all coastal stocks would meet PSC agreement management objectives under 2018 regulations.

The exploitation rate by U.S. fisheries south of the Canadian border on Interior Fraser (B.C.) coho is projected to be 6.0 percent, which is well below the anticipated 10.0 percent allowable exploitation rate under the 2019 PST Coho Agreement. The Council area fisheries portion would be 1.2 percent.

Coho bycatch during Puget Sound fisheries directed at pink, chum, and sockeye salmon will also be a consideration for preseason planning.

Summary

The effects of projected impacts (where available) under 2018 fishery regulations and 2019 abundance forecasts are as follows:

- SRFC are not at risk of approaching an over-fished condition.
- For SRWC, the predicted age-3 impact rate is less than the maximum allowable rate specified by the control rule and thus meets the 2019 objective.
- KRFC are not at risk of approaching an over-fished condition.
- The KRFC age-4 ocean harvest rate would not exceed the California Coastal Chinook ESA consultation standard.
- Willapa Bay, Grays Harbor, Queets, Hoh, Quillayute fall, Hood Canal, Skagit, and Stillaguamish coho would achieve S_{MSY} spawning escapement objectives.
- Strait of Juan de Fuca and Snohomish coho would not achieve S_{MSY} spawning escapement objectives.
- OCN coho and LCN coho stocks would have projected exploitation rates that comply with anticipated ESA consultation standards.
- All coho stocks would have exploitation rates below the MFMT.
- All Puget Sound coho stocks except Hood Canal coho would have exploitation rates that comply with the annual rates allowed under the FMP harvest rate matrix and the PST 2002 Southern Coho Management Plan. The exploitation rate on Hood Canal coho would exceed the rate allowed under both the FMP harvest rate matrix and the PST 2002 Southern Coho Management Plan.
- All coastal coho stocks would have exploitation rates that comply with the annual rates allowed under the FMP harvest rate matrix and the PST 2002 Southern Coho Management Plan.

Conclusion

The No-Action alternative would not meet the Purpose and Need for the proposed action because:

- The projected total exploitation rate on Hood Canal natural coho would be above the rate allowed under the FMP harvest rate matrix and above PST management objectives.

The No-Action alternative does not reflect consideration of changes in the status of salmon stocks from the previous year; therefore, over- or under- harvest of some salmon stocks would occur if this alternative were implemented. The analysis of the No-Action Alternative does, however, provide perspective that is useful in the planning process for 2019 ocean salmon fishery management measures. An understanding of stock shortfalls and surpluses under the No-Action Alternative helps managers, advisors, and constituents construct viable alternatives to the status-quo management measures.

TABLE V-I. 2018 Commercial troll management measures for non-Indian ocean salmon fisheries - Council adopted.
(Page 1 of 6)

A. SEASON DESCRIPTIONS
North of Cape Falcon
Supplemental Management Information
1 Overall non-Indian TAC: 55,000 Chinook and 47,600 coho marked with a healed adipose fin clip (marked). 2. Non-Indian commercial troll TAC: 27,500 Chinook and 5,600 marked coho.
Model #: Coho-1830, Chin3218
U.S./Canada Border to Cape Falcon • May 1 through the earlier of June 30 or 16,500 Chinook, no more than 5,200 of which may be caught in the area between the U.S./Canada border and the Queets River, and no more than 4,600 of which may be caught in the area between Leadbetter Pt. and Cape Falcon (C.8). Open seven days per week (C.1). All salmon except coho may be retained (C.4, C.7). Chinook minimum size limit of 28 inches total length (B). See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3). Chinook landing and possession limits per vessel per landing week (Thurs. - Wed.) are in place: -U.S./Canada border to the Queets River: 50 Chinook; -Queets River to Leadbetter Point: 100 Chinook; -Leadbetter Point to Cape Falcon: 50 Chinook (C.1, C.6). When it is projected that approximately 60% of the overall Chinook guideline has been landed, or approximately 60% of the Chinook subarea guideline has been landed in the area between the U.S./Canada border and the Queets River, or approximately 60% of the Chinook subarea guideline has been landed in the area between Leadbetter Pt. and Cape Falcon, inseason action will be considered to ensure the guideline is not exceeded.
U.S./Canada Border to Cape Falcon • July 1 through the earlier of September 19 or 11,000 Chinook or 5,600 coho, no more than 4,600 Chinook may be caught in the area between the U.S./Canada border and the Queets River, and no more than 1,300 Chinook may be caught in the area between Leadbetter Pt. and Cape Falcon (C.8). Open seven days per week. All salmon may be retained, except no chum retention north of Cape Alava, Washington in August and September (C.4, C.7). Chinook minimum size limit of 28 inches total length. Coho minimum size limit of 16 inches total length (B, C.1). All coho must be marked with a healed adipose fin clip (C.8.e). See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3). In the area between the U.S./Canada border and the Queets River and the area between Leadbetter Pt. and Cape Falcon, a landing and possession limit of 50 Chinook per vessel per landing week (Thurs. - Wed.) will be in place (C.1, C.6). Landing and possession limit of 10 coho per vessel per landing week (C.1). When it is projected that approximately 60% of the overall Chinook guideline has been landed, or approximately 60% of the Chinook subarea guideline has been landed in the area between the U.S./Canada border and the Queets River, or approximately 60% of the Chinook subarea guideline has been landed in the area between Leadbetter Pt. and Cape Falcon, inseason action will be considered to ensure the guideline is not exceeded.
For all commercial troll fisheries north of Cape Falcon: Mandatory closed areas include: Salmon troll Yelloweye Rockfish Conservation Area, Cape Flattery and Columbia Control Zones, and beginning August 13, Grays Harbor Control Zone (C.5). Vessels must land and deliver their salmon within 24 hours of any closure of this fishery. Vessels fishing, or in possession of salmon while fishing, north of Leadbetter Point must land and deliver all species of fish within the area and north of Leadbetter Point. Vessels fishing, or in possession of salmon while fishing, south of Leadbetter Point must land and deliver all species of fish within the area and south of Leadbetter Point, except that Oregon permitted vessels may also land all species of fish in Garibaldi, Oregon. Under state law, vessels must report their catch on a state fish receiving ticket. Oregon State regulations require all fishers landing salmon into Oregon from any fishery between Leadbetter Point, Washington and Cape Falcon, Oregon must notify ODFW within one hour of delivery or prior to transport away from the port of landing by either calling 541-867-0300 ext. 271 or sending notification via e-mail to nfalcon.trollreport@state.or.us. Notification shall include vessel name and number, number of salmon by species, port of landing and location of delivery, and estimated time of delivery. Inseason actions may modify harvest guidelines in later fisheries to achieve or prevent exceeding the overall allowable troll harvest impacts (C.8). Vessels in possession of salmon north of the Queets River may not cross the Queets River line without first notifying WDFW at 360-249-1215 with area fished, total Chinook, coho and halibut catch aboard, and destination. Vessels in possession of salmon south of the Queets River may not cross the Queets River line without first notifying WDFW at 360-249-1215 with area fished, total Chinook, coho and halibut catch aboard, and destination.

TABLE 1. 2018 Commercial troll management measures for non-Indian ocean salmon fisheries - Council adopted. (Page 2 of 6)

A. SEASON DESCRIPTIONS

South of Cape Falcon

Supplemental Management Information

1. Sacramento River fall Chinook spawning escapement of 151,009 hatchery and natural area adults.
2. Sacramento Index exploitation rate of 34.2%.
3. Klamath River recreational fishery allocation: 3,490 adult Klamath River fall Chinook.
4. Klamath tribal allocation: 18,122 adult Klamath River fall Chinook.
5. CA/OR share of Klamath River fall Chinook commercial ocean harvest: 75% / 25%.

Cape Falcon to Humbug Mt.

- May 4-14 and 19-31;
- June 4-12 and 16-30;
- July 5-12 and 16-31;
- August 3-7, 13-17, and 25-29;
- September 1-October 31 (C.9.a).

Open seven days per week. All salmon except coho may be retained (C.4, C.7). Chinook minimum size limit of 28 inches total length (B, C.1). All vessels fishing in the area must land their salmon in the State of Oregon. See gear restrictions and definitions (C.2, C.3) and Oregon State regulations for a description of special regulations at the mouth of Tillamook Bay.

Beginning September 1 no more than 50 Chinook allowed per vessel per landing week (Thurs.-Wed.); and only open shoreward of the 40 fathom management line beginning October 1.

In 2019, the season will open March 15 for all salmon except coho. Chinook minimum size limit of 28 inches total length. Gear restrictions same as in 2018. This opening could be modified following Council review at its March 2019 meeting.

Humbug Mt. to OR/CA Border (Oregon KMZ)

- May 4-14 and 19-31;
- June 4-12 and 16-30, or a 1,500 Chinook quota;
- July 5-12 and 16-31, or a 2,000 Chinook quota;
- August 3-7, 13-17, and 25-29, or a 500 Chinook quota; (C.9.a).

Open seven days per week. All salmon except coho may be retained (C.4, C.7). Chinook minimum size limit of 28 inches total length (B, C.1). See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3). Prior to June 1, all salmon caught in this area must be landed and delivered in the State of Oregon.

June 4 - August 29 weekly landing and possession limit of 50 Chinook per vessel per landing week (Thurs.-Wed.). Any remaining portion of a monthly Chinook quota may be transferred inseason on an impact neutral basis to the next open quota period (C.8.b).

All vessels fishing in this area from June through August must land and deliver all salmon within this area or into Port Orford, within 24 hours of any closure of this fishery, and prior to fishing outside of this area. For all quota managed seasons, Oregon state regulations require fishers to notify ODFW within one hour of landing and prior to transport away from the port of landing by calling 541-867-0300 Ext. 252 or sending notification via e-mail to kmzor.trollreport@state.or.us, with vessel name and number, number of salmon by species, location of delivery, and estimated time of delivery.

In 2019, the season will open March 15 for all salmon except coho. Chinook minimum size limit of 28 inches total length. Gear restrictions same as in 2018. This opening could be modified following Council review at its March 2019 meeting.

OR/CA Border to Humboldt South Jetty (California KMZ)

- May 1 through the earlier of May 29, or a 3,600 Chinook quota;
- June 1 through the earlier of June 30, or a 4,000 Chinook quota;
- July 1 through the earlier of July 31, or a 4,000 Chinook quota;
- August 3 through the earlier of August 31, or a 4,000 Chinook quota (C.9.b).

Open five days per week (Fri.-Tue.). All salmon except coho may be retained (C.4, C.7). Chinook minimum size limit of 26 inches total length (B, C.1). Landing and possession limit of 20 Chinook per vessel per day (C.8.f). Any remaining portion of a monthly Chinook quota may be transferred inseason on an impact neutral basis to the next open quota period (C.8.g). See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3).

All fish caught in this area must be landed within the area and within 24 hours of any closure of the fishery and prior to fishing outside the area (C.10). Klamath Control Zone closed (C.5.e). See California State regulations for additional closures adjacent to the Smith and Klamath rivers.

Humboldt South Jetty to Horse Mt.

- Closed.

For all commercial troll fisheries south of Cape Falcon When the fishery is closed between the OR/CA border and Humbug Mountain and open to the south, vessels with fish on board caught in the open area off California may seek temporary mooring in Brookings, Oregon prior to landing in California, only if such vessels first notify the Chetco River Coast Guard Station via VHF channel 22A between the hours of 0500 and 2200 and provide the vessel name, number of fish on board, and estimated time of arrival (C.6).

TABLE 1. 2018 Commercial troll management measures for non-Indian ocean salmon fisheries - Council adopted. (Page 3 of 6)

A. SEASON DESCRIPTIONS

Horse Mt. to Point Arena (Fort Bragg)

- July 26-31;
- August 3-29;
- September 1-30 (C.9.b).

Open seven days per week. All salmon except coho may be retained (C.4, C.7). Chinook minimum size limit of 26 inches total length (B, C.1). See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3). All salmon must be landed in California.

All salmon caught in the area prior to September 1 must be landed and offloaded no later than 11:59 p.m., August 30 (C.6). When the CA KMZ fishery is open, all fish caught in the area must be landed south of Horse Mountain until the CA KMZ fishery has been closed for at least 24 hours (C.6). During September, all fish must be landed north of Point Arena (C.6).

In 2019, the season will open April 16-30 for all salmon except coho, with a 27 inch Chinook minimum size limit and the same gear restrictions as in 2018. All salmon caught in the area must be landed in the area. This opening could be modified following Council review at its March 2019 meeting.

Point Arena to Pigeon Point (San Francisco)

- July 26-31;
- August 3-29;
- September 1-30 (C.9.b).

Open seven days per week. All salmon except coho may be retained (C.4, C.7). Chinook minimum size limit of 26 inches total length (B, C.1). See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3). All salmon must be landed in California.

All salmon caught in the area prior to September 1 must be landed and offloaded no later than 11:59 p.m., August 30 (C.6). When the CA KMZ fishery is open, all fish caught in the area must be landed south of Horse Mountain until the CA KMZ fishery has been closed for at least 24 hours (C.6). During September, all fish must be landed south of Point Arena (C.6).

Point Reyes to Point San Pedro (Fall Area Target Zone)

- October 1-5 and 8-12.

Open five days per week, Monday through Friday. All salmon except coho may be retained (C.4, C.7). Chinook minimum size limit of 26 inches total length (B, C.1). All salmon caught in this area must be landed between Point Arena and Pigeon Point (C.6). See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3).

Pigeon Point to U.S./Mexico Border (Monterey)

- May 1-7;
- June 19-30 (C.9.b).

Open seven days per week. All salmon except coho may be retained (C.4, C.7). Chinook minimum size limit of 26 inches total length (B, C.1). See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3). All salmon must be landed in California.

All salmon caught in the area must be landed and offloaded no later than 11:59 p.m., July 15 (C.6).

When the CA KMZ fishery is open, all fish caught in the area must be landed south of Horse Mountain until the CA KMZ fishery has been closed for at least 24 hours (C.6).

For all commercial troll fisheries In California: California State regulations require all salmon be made available to a CDFW representative for sampling immediately at port of landing. Any person in possession of a salmon with a missing adipose fin, upon request by an authorized agent or employee of the CDFW, shall immediately relinquish the head of the salmon to the State (California Fish and Game Code §8226).

TABLE V-1. 2018 Commercial troll management measures for non-Indian ocean salmon fisheries - Council adopted. (Page 4 of 6)

B. MINIMUM SIZE (Inches) (See C.1)

Area (when open)	Chinook		Coho		Pink
	Total Length	Head-off	Total Length	Head-off	
North of Cape Falcon	28	21.5	16	12	None
Cape Falcon to Humbug Mt.	28	21.5	-	-	None
Humbug Mt. to OR/CA Border	28	21.5	-	-	None
OR/CA Border to Humboldt South Jetty	26	19.5	-	-	26
Horse Mt. to Pt. Arena	26	19.5	-	-	26
Pt. Arena to Pigeon Pt.	26	19.5	-	-	26
Pigeon Pt. to U.S./Mexico Border	26	19.5	-	-	26

C. REQUIREMENTS, DEFINITIONS, RESTRICTIONS, OR EXCEPTIONS

C.1. Compliance with Minimum Size or Other Special Restrictions: All salmon on board a vessel must meet the minimum size, landing/possession limit, or other special requirements for the area being fished and the area in which they are landed if the area is open or has been closed less than 48 hours for that species of salmon. Salmon may be landed in an area that has been closed for a species of salmon more than 48 hours only if they meet the minimum size, landing/possession limit, or other special requirements for the area in which they were caught. Salmon may not be filleted prior to landing.

Any person who is required to report a salmon landing by applicable state law must include on the state landing receipt for that landing both the number and weight of salmon landed by species. States may require fish landing/receiving tickets be kept on board the vessel for 90 days or more after landing to account for all previous salmon landings.

C.2. Gear Restrictions:

a. Salmon may be taken only by hook and line using single point, single shank, barbless hooks.
b. Cape Falcon, Oregon, to the OR/CA border: No more than 4 spreads are allowed per line.
c. OR/CA border to U.S./Mexico border: No more than 6 lines are allowed per vessel, and barbless circle hooks are required when fishing with bait by any means other than trolling.

C.3. Gear Definitions:

Trolling defined: Fishing from a boat or floating device that is making way by means of a source of power, other than drifting by means of the prevailing water current or weather conditions.
Troll fishing gear defined: One or more lines that drag hooks behind a moving fishing vessel engaged in trolling. In that portion of the fishery management area off Oregon and Washington, the line or lines must be affixed to the vessel and must not be intentionally disengaged from the vessel at any time during the fishing operation.
Spread defined: A single leader connected to an individual lure and/or bait.
Circle hook defined: A hook with a generally circular shape and a point which turns inward, pointing directly to the shank at a 90º angle.

C.4. Vessel Operation in Closed Areas with Salmon on Board:

a. Except as provided under C.4.b below, it is unlawful for a vessel to have troll or recreational gear in the water while in any area closed to fishing for a certain species of salmon, while possessing that species of salmon; however, fishing for species other than salmon is not prohibited if the area is open for such species, and no salmon are in possession.
b. When Genetic Stock Identification (GSI) samples will be collected in an area closed to commercial salmon fishing, the scientific research permit holder shall notify NOAA OLE, USCG, CDFW, WDFW, ODFW and OSP at least 24 hours prior to sampling and provide the following information: the vessel name, date, location and time collection activities will be done. Any vessel collecting GSI samples in a closed area shall not possess any salmon other than those from which GSI samples are being collected. Salmon caught for collection of GSI samples must be immediately released in good condition after collection of samples.

C.5. Control Zone Definitions:

a. *Cape Flattery Control Zone* - The area from Cape Flattery (48º23'00" N. lat.) to the northern boundary of the U.S. EEZ; and the area from Cape Flattery south to Cape Alava (48º10'00" N. lat.) and east of 125º05'00" W. long.
b. *Mandatory Yelloweye Rockfish Conservation Area* – The area in Washington Marine Catch Area 3 from 48°00.00' N. lat.; 125°14.00' W. long. to 48°02.00' N. lat.; 125°14.00' W. long. to 48°02.00' N. lat.; 125°16.50' W. long. to 48°00.00' N. lat.; 125°16.50' W. long. and connecting back to 48°00.00' N. lat.; 125°14.00' W. long.
c. *Grays Harbor Control Zone* - The area defined by a line drawn from the Westport Lighthouse (46° 53'18" N. lat., 124° 07'01" W. long.) to Buoy #2 (46° 52'42" N. lat., 124°12'42" W. long.) to Buoy #3 (46° 55'00" N. lat., 124°14'48" W. long.) to the Grays Harbor north jetty (46° 55'36" N. lat., 124°10'51" W. long.).
d. *Columbia Control Zone* - An area at the Columbia River mouth, bounded on the west by a line running northeast/southwest between the red lighted Buoy #4 (46°13'35" N. lat., 124°06'50" W. long.) and the green lighted Buoy #7 (46°15'09' N. lat., 124°06'16" W. long.); on the east, by the Buoy #10 line which bears north/south at 357° true from the south jetty at 46°14'00" N. lat.,124°03'07" W. long. to its intersection with the north jetty; on the north, by a line running

C. REQUIREMENTS, DEFINITIONS, RESTRICTIONS, OR EXCEPTIONS

C.5. Control Zone Definitions (continued):

northeast/southwest between the red lighted Buoy #4 and tip of the south jetty (46°14'03" N. lat., 124°04'05" W. long.), and then along the south jetty to the point of intersection with the Buoy #10 line.

e. *Klamath Control Zone* - The ocean area at the Klamath River mouth bounded on the north by 41°38'48" N. lat. (approximately 6 nautical miles north of the Klamath River mouth); on the west by 124°23'00" W. long. (approximately 12 nautical miles off shore); and on the south by 41°26'48" N. lat. (approximately 6 nautical miles south of the Klamath River mouth).

f. Waypoints for the 40 fathom regulatory line from Cape Falcon to Humbug Mt. (50 CFR 660.71 (k) (12)-(70).

45°46.00′ N. lat., 124°04.49′ W. long.;	44°41.68′ N. lat., 124°15.38′ W. long.;	43°17.96′ N. lat., 124°28.81′ W. long.;
45°44.34′ N. lat., 124°05.09′ W. long.;	44°34.87′ N. lat., 124°15.80′ W. long.;	43°16.75′ N. lat., 124°28.42′ W. long.;
45°40.64′ N. lat., 124°04.90′ W. long.;	44°33.74′ N. lat., 124°14.44′ W. long.;	43°13.97′ N. lat., 124°31.99′ W. long.;
45°33.00′ N. lat., 124°04.46′ W. long.;	44°27.66′ N. lat., 124°16.99′ W. long.;	43°13.72′ N. lat., 124°33.25′ W. long.;
45°32.27′ N. lat., 124°04.74′ W. long.;	44°19.13′ N. lat., 124°19.22′ W. long.;	43°12.26′ N. lat., 124°34.16′ W. long.;
45°29.26′ N. lat., 124°04.22′ W. long.;	44°15.35′ N. lat., 124°17.38′ W. long.;	43°10.96′ N. lat., 124°32.33′ W. long.;
45°20.25′ N. lat., 124°04.67′ W. long.;	44°14.38′ N. lat., 124°17.78′ W. long.;	43°05.65′ N. lat., 124°31.52′ W. long.;
45°19.99′ N. lat., 124°04.62′ W. long.;	44°12.80′ N. lat., 124°17.18′ W. long.;	42°59.66′ N. lat., 124°32.58′ W. long.;
45°17.50′ N. lat., 124°04.91′ W. long.;	44°09.23′ N. lat., 124°15.96′ W. long.;	42°54.97′ N. lat., 124°36.99′ W. long.;
45°11.29′ N. lat., 124°05.20′ W. long.;	44°08.38′ N. lat., 124°16.79′ W. long.;	42°53.81′ N. lat., 124°38.57′ W. long.;
45°05.80′ N. lat., 124°05.40′ W. long.;	44°08.30′ N. lat., 124°16.75′ W. long.;	42°50.00′ N. lat., 124°39.68′ W. long.;
45°05.08′ N. lat., 124°05.93′ W. long.;	44°01.18′ N. lat., 124°15.42′ W. long.;	42°49.13′ N. lat., 124°39.70′ W. long.;
45°03.83′ N. lat., 124°06.47′ W. long.;	43°51.61′ N. lat., 124°14.68′ W. long.;	42°46.47′ N. lat., 124°38.89′ W. long.;
45°01.70′ N. lat., 124°06.53′ W. long.;	43°42.66′ N. lat., 124°15.46′ W. long.;	42°45.74′ N. lat., 124°38.86′ W. long.;
44°58.75′ N. lat., 124°07.14′ W. long.;	43°40.49′ N. lat., 124°15.74′ W. long.;	42°44.79′ N. lat., 124°37.96′ W. long.;
44°51.28′ N. lat., 124°10.21′ W. long.;	43°38.77′ N. lat., 124°15.64′ W. long.;	42°45.01′ N. lat., 124°36.39′ W. long.;
44°49.49′ N. lat., 124°10.90′ W. long.;	43°34.52′ N. lat., 124°16.73′ W. long.;	42°44.14′ N. lat., 124°35.17′ W. long.;
44°44.96′ N. lat., 124°14.39′ W. long.;	43°28.82′ N. lat., 124°19.52′ W. long.;	42°42.14′ N. lat., 124°32.82′ W. long.;
44°43.44′ N. lat., 124°14.78′ W. long.;	43°23.91′ N. lat., 124°24.28′ W. long.;	42°40.50′ N. lat., 124°31.98′ W. long.
44°42.26′ N. lat., 124°13.81′ W. long.;	43°20.83′ N. lat., 124°26.63′ W. long.;	

C.6. Notification When Unsafe Conditions Prevent Compliance with Regulations: If prevented by unsafe weather conditions or mechanical problems from meeting special management area landing restrictions, vessels must notify the U.S. Coast Guard and receive acknowledgment of such notification prior to leaving the area. This notification shall include the name of the vessel, port where delivery will be made, approximate number of salmon (by species) on board, the estimated time of arrival, and the specific reason the vessel is not able to meet special management area landing restrictions.

In addition to contacting the U.S. Coast Guard, vessels fishing south of the Oregon/California border must notify CDFW within one hour of leaving the management area by calling 800-889-8346 and providing the same information as reported to the U.S. Coast Guard. All salmon must be offloaded within 24 hours of reaching port.

C.7. Incidental Halibut Harvest: During authorized periods, the operator of a vessel that has been issued an incidental halibut harvest license may retain Pacific halibut caught incidentally in Area 2A while trolling for salmon. Halibut retained must be no less than 32 inches in total length, measured from the tip of the lower jaw with the mouth closed to the extreme end of the middle of the tail, and must be landed with the head on. When halibut are caught and landed incidental to commercial salmon fishing by an IPHC license holder, any person who is required to report the salmon landing by applicable state law must include on the state landing receipt for that landing both the number of halibut landed, and the total dressed, head-on weight of halibut landed, in pounds, as well as the number and species of salmon landed.

License applications for incidental harvest must be obtained from the International Pacific Halibut Commission (phone: 206-634-1838). Applicants must apply prior to mid-March 2018 for 2018 permits (*exact date to be set by the IPHC in early 2018*). Incidental harvest is authorized only during April, May, and June of the 2018 troll seasons, and after June 30 in 2018 if quota remains and if announced on the NMFS hotline (phone: 800-662-9825 or 206-526-6667). WDFW, ODFW, and CDFW will monitor landings. If the landings are projected to exceed the IPHC's 35,620 pound preseason allocation or the total Area 2A non-Indian commercial Pacific halibut allocation, NMFS will take inseason action to prohibit retention of halibut in the non-Indian salmon troll fishery.

Incidental Pacific halibut catch regulations in the commercial salmon troll fishery adopted for 2018, prior to any 2018 inseason action, will be in effect when incidental Pacific halibut retention opens on April 1, 2019 unless otherwise modified by inseason action at the March 2019 Council meeting

May 1, 2018 until the end of the 2018 salmon troll season, and April 1-30, 2019, license holders may land or possess no more than one Pacific halibut per two Chinook, except one Pacific halibut may be possessed or landed without meeting the ratio requirement, and no more than 25 halibut may be possessed or landed per trip.

C. REQUIREMENTS, DEFINITIONS, RESTRICTIONS, OR EXCEPTIONS *(continued)*

a. "C-shaped" yelloweye rockfish conservation area is an area to be voluntarily avoided for salmon trolling. NMFS and the Council request salmon trollers voluntarily avoid this area in order to protect yelloweye rockfish. The area is defined in the Pacific Council Halibut Catch Sharing Plan in the North Coast subarea (Washington marine area 3), with the following coordinates in the order listed:

48°18' N. lat.; 125°18' W. long.;
48°18' N. lat.; 124°59' W. long.;
48°11' N. lat.; 124°59' W. long.;
48°11' N. lat.; 125°11' W. long.;
48°04' N. lat.; 125°11' W. long.;
48°04' N. lat.; 124°59' W. long.;
48°00' N. lat.; 124°59' W. long.;
48°00' N. lat.; 125°18' W. long.;
and connecting back to 48°18' N. lat.; 125°18' W. long.

C.8. Inseason Management: In addition to standard inseason actions or modifications already noted under the season description, the following inseason guidance is provided to NMFS:

a. Chinook remaining from the May through June non-Indian commercial troll harvest guideline north of Cape Falcon may be transferred to the July through September harvest guideline if the transfer would not result in exceeding preseason impact expectations on any stocks.
b. Chinook remaining from the June or July non-Indian commercial troll quotas in the Oregon KMZ may be transferred to the Chinook quota for the next open quota period if the transfer would not result in exceeding preseason impact expectations on any stocks.
c. NMFS may transfer salmon between the recreational and commercial fisheries north of Cape Falcon if there is agreement among the areas' representatives on the Salmon Advisory Subpanel (SAS), and if the transfer would not result in exceeding preseason impact expectations on any stocks.
d. At the March 2019 meeting, the Council will consider inseason recommendations for special regulations for any experimental fisheries (proposals must meet Council protocol and be received in November 2018).
e. If retention of unmarked coho (adipose fin intact) is permitted by inseason action, the allowable coho quota will be adjusted to ensure preseason projected impacts on all stocks is not exceeded.
f. Landing limits may be modified inseason to sustain season length and keep harvest within overall quotas.
g. Chinook remaining from the May, June, and /or July non-Indian commercial troll quotas in the California KMZ may be transferred to the Chinook quota for the next open period if the transfer would not result in exceeding preseason impact expectations on any stocks.

C.9. State Waters Fisheries: Consistent with Council management objectives:

a. The State of Oregon may establish additional late-season fisheries in state waters.
b. The State of California may establish limited fisheries in selected state waters. Check state regulations for details.

C.10 For the purposes of California Fish and Game Code, Section 8232.5, the definition of the Klamath Management Zone (KMZ) for the ocean salmon season shall be that area from Humbug Mountain, Oregon, to Horse Mountain, California.

TABLE V-2. 2018 Recreational management measures for non-Indian ocean salmon fisheries - Council adopted. (Page 1 of 5)

A. SEASON DESCRIPTIONS
North of Cape Falcon
Supplemental Management Information
1. Overall non-Indian TAC: 55,000 Chinook and 47,600 coho marked with a healed adipose fin clip (marked). 2. Recreational TAC: 27,500 Chinook and 42,000 marked coho; all retained coho must be marked. 3. No Area 4B add-on fishery. 4. Buoy 10 fishery opens August 1 with an expected landed catch of 25,000 marked coho in August and September.
U.S./Canada Border to Cape Alava (Neah Bay Subarea) • June 23 through earlier of September 3 or 4,370 marked coho subarea quota with a subarea guideline of 4,900 Chinook (C.5). Open seven days per week. All salmon may be retained, except no chum beginning August 1; two salmon per day, no more than one of which may be a Chinook. All coho must be marked with a healed adipose fin clip (C.1). Beginning August 1, Chinook non-retention east of the Bonilla-Tatoosh line (C.4.a) during Council managed ocean fishery. See gear restrictions and definitions (C.2, C.3).
Cape Alava to Queets River (La Push Subarea) • June 23 through earlier of September 3 or 1,090 marked coho subarea quota with a subarea guideline of 1,500 Chinook (C.5). Open seven days per week. All salmon may be retained, two salmon per day. All coho must be marked with a healed adipose fin clip (C.1). See gear restrictions and definitions (C.2, C.3).
Queets River to Leadbetter Point (Westport Subarea) • July 1 through earlier of September 3 or 15,540 marked coho subarea quota with a subarea guideline of 13,100 Chinook (C.5). Open five days per week (Sun. - Thurs.). All salmon may be retained; two salmon per day, no more than one of which may be a Chinook. All coho must be marked with a healed adipose fin clip (C.1). See gear restrictions and definitions (C.2, C.3). Grays Harbor Control Zone closed beginning August 13 (C.4.b).
Leadbetter Point to Cape Falcon (Columbia River Subarea) • June 23 through earlier of September 3 or 21,000 marked coho subarea quota with a subarea guideline of 8,000 Chinook (C.5). Open seven days per week. All salmon may be retained; two salmon per day, no more than one of which may be a Chinook. All coho must be marked with a healed adipose fin clip (C.1). See gear restrictions and definitions (C.2, C.3). Columbia Control Zone closed (C.4.c).
For all recreational fisheries North of Cape Falcon: Inseason management may be used to sustain season length and keep harvest within the overall Chinook and coho recreational TACs for north of Cape Falcon (C.5).

TABLE 2. 2018 Recreational management measures for non-Indian ocean salmon fisheries - Council adopted. (Page 2 of 5)

A. SEASON DESCRIPTIONS

South of Cape Falcon

Supplemental Management Information

1. Sacramento River fall Chinook spawning escapement of 151,009 hatchery and natural area adults.
2. Sacramento Index exploitation rate of 34.2%.
3. Klamath River recreational fishery allocation: 3,490 adult Klamath River fall Chinook.
4. Klamath tribal allocation: 18,122 adult Klamath River fall Chinook.
5. Overall recreational coho TAC: 35,000 coho marked with a healed adipose fin clip (marked), and 3,500 coho in the non-mark-selective coho fishery.

Cape Falcon to Humbug Mt.

- March 15-October 31 (C.6), except as provided below during the mark-selective coho fishery and the non-mark-selective coho fishery (C.5).

Open seven days per week. All salmon except coho may be retained, two salmon per day (C.1). Chinook minimum size limit of 24 inches total length (B). See gear restrictions and definitions (C.2, C.3).

October 1-31: The fishery is only open shoreward of the 40 fathom management line.

In 2019, the season will open March 15 for all salmon except coho, two salmon per day (C.1). Chinook minimum size limit of 24 inches total length (B); and the same gear restrictions as in 2018 (C.2, C.3). This opening could be modified following Council review at its March 2019 meeting.

Cape Falcon to Humbug Mt.

Mark-selective coho fishery:

- June 30 through the earlier of September 3, or a landed catch of 35,000 marked coho (C.6).

Open seven days per week. All salmon may be retained, except all retained coho must be marked with a healed adipose fin clip, two salmon per day (C.1). See minimum size limits (B). See gear restrictions and definitions (C.2, C.3, C.5.e).

Non-mark-selective coho fishery:

- September 7-8, and each Friday through Saturday thereafter through the earlier of September 29 or a landed catch of a 3,500 non-mark-selective coho quota (C.6). Open days may be modified inseason.

All salmon may be retained, two salmon per day (C.1). See minimum size limits (B). See gear restrictions and definitions (C.2, C.3).

Humbug Mt. to OR/CA Border (Oregon KMZ)

- May 19-August 26 (C.6).

Open seven days per week. All salmon except coho may be retained, two salmon per day (C.1). Chinook minimum size limit of 24 inches total length (B). See gear restrictions and definitions (C.2, C.3).

For Recreational Fisheries from Cape Falcon to Humbug Mt.: Fishing in the Stonewall Bank yelloweye rockfish conservation area restricted to trolling only on days the all depth recreational halibut fishery is open (call the halibut fishing hotline 1-800-662-9825 for specific dates) (C.3.b, C.4.d).

TABLE 2. 2018 Recreational management measures for non-Indian ocean salmon fisheries - Council adopted. (Page 3 of 5)

A. SEASON DESCRIPTIONS

OR/CA Border to Horse Mt. (California KMZ)

- June 1-September 3 (C.6).

Open seven days per week. All salmon except coho may be retained, two salmon per day (C.1). Chinook minimum size limit of 20 inches total length (B). See gear restrictions and definitions (C.2, C.3).

Klamath Control Zone closed in August (C.4.e). See California State regulations for additional closures adjacent to the Smith, Eel, and Klamath Rivers.

Horse Mt. to Point Arena (Fort Bragg)

- June 17-October 31 (C.6).

Open seven days per week. All salmon except coho may be retained, two salmon per day (C.1). Chinook minimum size limit of 20 inches total length (B). See gear restrictions and definitions (C.2, C.3).

In 2019, season opens April 6 for all salmon except coho, two salmon per day (C.1). Chinook minimum size limit of 20 inches total length (B); and the same gear restrictions as in 2018 (C.2, C.3). This opening could be modified following Council review at its March 2019 meeting.

Point Arena to Pigeon Point (San Francisco)

- June 17-October 31 (C.6).

Open seven days per week. All salmon except coho may be retained, two salmon per day (C.1). Chinook minimum size limit of 20 inches total length (B). See gear restrictions and definitions (C.2, C.3).

In 2019, season opens April 6 for all salmon except coho, two salmon per day (C.1). Chinook minimum size limit of 24 inches total length (B); and the same gear restrictions as in 2018 (C.2, C.3). This opening could be modified following Council review at its March 2019 meeting.

Pigeon Point to U.S./Mexico Border (Monterey)

- April 7-July 2 (C.6).

Open seven days per week. All salmon except coho may be retained, two salmon per day (C.1). Chinook minimum size limit of 24 inches total length (B). See gear restrictions and definitions (C.2, C.3).

In 2019, season opens April 6 for all salmon except coho, two salmon per day (C.1). Chinook minimum size limit of 24 inches total length (B); and the same gear restrictions as in 2018 (C.2, C.3). This opening could be modified following Council review at its March 2019 meeting.

California State regulations require all salmon be made available to a CDFW representative for sampling immediately at port of landing. Any person in possession of a salmon with a missing adipose fin, upon request by an authorized agent or employee of the CDFW, shall immediately relinquish the head of the salmon to the state. (California Code of Regulations Title 14 Section 1.73)

B. MINIMUM SIZE (Inches) (See C.1)

Area (when open)	Chinook	Coho	Pink
North of Cape Falcon	24	16	None
Cape Falcon to Humbug Mt.	24	16	None
Humbug Mt. to OR/CA Border	24	-	None
OR/CA Border to Horse Mt.	20	-	20
Horse Mt. to Pt. Arena	20	-	20
Pt. Arena to Pigeon Pt.	20	-	20
Pigeon Pt. to U.S./Mexico Border	24	-	24

C. REQUIREMENTS, DEFINITIONS, RESTRICTIONS, OR EXCEPTIONS

C.1. Compliance with Minimum Size and Other Special Restrictions: All salmon on board a vessel must meet the minimum size or other special requirements for the area being fished and the area in which they are landed if that area is open. Salmon may be landed in an area that is closed only if they meet the minimum size or other special requirements for the area in which they were caught. Salmon may not be filleted prior to landing.

Ocean Boat Limits: Off the coast of Washington, Oregon, and California, each fisher aboard a vessel may continue to use angling gear until the combined daily limits of Chinook and coho salmon for all licensed and juvenile anglers aboard have been attained (additional state restrictions may apply).

C.2. Gear Restrictions: Salmon may be taken only by hook and line using barbless hooks. All persons fishing for salmon, and all persons fishing from a boat with salmon on board, must meet the gear restrictions listed below for specific areas or seasons.

a. *U.S./Canada Border to Pt. Conception, California*: No more than one rod may be used per angler; and no more than two single point, single shank barbless hooks are required for all fishing gear.

b. *Horse Mt., California, to Pt. Conception, California:* Single point, single shank, barbless circle hooks (see gear definitions below) are required when fishing with bait by any means other than trolling, and no more than two such hooks shall be used. When angling with two hooks, the distance between the hooks must not exceed five inches when measured from the top of the eye of the top hook to the inner base of the curve of the lower hook, and both hooks must be permanently tied in place (hard tied). Circle hooks are not required when artificial lures are used without bait.

C.3. Gear Definitions:

a. *Recreational fishing gear defined*: Off Oregon and Washington, angling tackle consists of a single line that must be attached to a rod and reel held by hand or closely attended; the rod and reel must be held by hand while playing a hooked fish. No person may use more than one rod and line while fishing off Oregon or Washington. Off California, the line must be attached to a rod and reel held by hand or closely attended; weights directly attached to a line may not exceed four pounds (1.8 kg). While fishing off California north of Pt. Conception, no person fishing for salmon, and no person fishing from a boat with salmon on board, may use more than one rod and line. Fishing includes any activity which can reasonably be expected to result in the catching, taking, or harvesting of fish.

b. *Trolling defined*: Angling from a boat or floating device that is making way by means of a source of power, other than drifting by means of the prevailing water current or weather conditions.

c. *Circle hook defined*: A hook with a generally circular shape and a point which turns inward, pointing directly to the shank at a 90° angle.

C.4. Control Zone Definitions:

a. *The Bonilla-Tatoosh Line*: A line running from the western end of Cape Flattery to Tatoosh Island Lighthouse (48°23'30" N. lat., 124°44'12" W. long.) to the buoy adjacent to Duntze Rock (48°24'37" N. lat., 124°44'37" W. long.), then in a straight line to Bonilla Pt. (48°35'39" N. lat., 124°42'58" W. long.) on Vancouver Island, British Columbia.

b. *Grays Harbor Control Zone* - The area defined by a line drawn from the Westport Lighthouse (46° 53'18" N. lat., 124° 07'01" W. long.) to Buoy #2 (46° 52'42" N. lat., 124°12'42" W. long.) to Buoy #3 (46° 55'00" N. lat., 124°14'48" W. long.) to the Grays Harbor north jetty (46° 55'36" N. lat., 124°10'51" W. long.).

c. *Columbia Control Zone*: An area at the Columbia River mouth, bounded on the west by a line running northeast/southwest between the red lighted Buoy #4 (46°13'35" N. lat., 124°06'50" W. long.) and the green lighted Buoy #7 (46°15'09' N. lat., 124°06'16" W. long.); on the east, by the Buoy #10 line which bears north/south at 357° true from the south jetty at 46°14'00" N. lat., 124°03'07" W. long. to its intersection with the north jetty; on the north, by a line running northeast/southwest between the green lighted Buoy #7 to the tip of the north jetty (46°15'48" N. lat., 124°05'20" W. long. and then along the north jetty to the point of intersection with the Buoy #10 line; and on the south, by a line running northeast/southwest between the red lighted Buoy #4 and tip of the south jetty (46°14'03" N. lat., 124°04'05" W. long.), and then along the south jetty to the point of intersection with the Buoy #10 line.

d. *Stonewall Bank Yelloweye Rockfish Conservation Area*: The area defined by the following coordinates in the order listed:

44°37.46' N. lat.; 124°24.92' W. long.
44°37.46' N. lat.; 124°23.63' W. long.
44°28.71' N. lat.; 124°21.80' W. long.
44°28.71' N. lat.; 124°24.10' W. long.
44°31.42' N. lat.; 124°25.47' W. long.
and connecting back to 44°37.46' N. lat.; 124°24.92' W. long.

e. *Klamath Control Zone*: The ocean area at the Klamath River mouth bounded on the north by 41°38'48" N. lat. (approximately 6 nautical miles north of the Klamath River mouth); on the west by 124°23'00" W. long. (approximately 12 nautical miles off shore); and, on the south by 41°26'48" N. lat. (approximately 6 nautical miles south of the Klamath River mouth).

TABLE V-2. 2018 Recreational management Alternatives for non-Indian ocean salmon fisheries - Council adopted. (Page 5 of 5)

f. Waypoints for the 40 fathom regulatory line from Cape Falcon to Humbug Mt. (50 CFR 660.71 (k) (12)-(70).

45°46.00′ N. lat., 124°04.49′ W. long.;	44°41.68′ N. lat., 124°15.38′ W. long.;	43°17.96′ N. lat., 124°28.81′ W. long.;
45°44.34′ N. lat., 124°05.09′ W. long.;	44°34.87′ N. lat., 124°15.80′ W. long.;	43°16.75′ N. lat., 124°28.42′ W. long.;
45°40.64′ N. lat., 124°04.90′ W. long.;	44°33.74′ N. lat., 124°14.44′ W. long.;	43°13.97′ N. lat., 124°31.99′ W. long.;
45°33.00′ N. lat., 124°04.46′ W. long.;	44°27.66′ N. lat., 124°16.99′ W. long.;	43°13.72′ N. lat., 124°33.25′ W. long.;
45°32.27′ N. lat., 124°04.74′ W. long.;	44°19.13′ N. lat., 124°19.22′ W. long.;	43°12.26′ N. lat., 124°34.16′ W. long.;
45°29.26′ N. lat., 124°04.22′ W. long.;	44°15.35′ N. lat., 124°17.38′ W. long.;	43°10.96′ N. lat., 124°32.33′ W. long.;
45°20.25′ N. lat., 124°04.67′ W. long.;	44°14.38′ N. lat., 124°17.78′ W. long.;	43°05.65′ N. lat., 124°31.52′ W. long.;
45°19.99′ N. lat., 124°04.62′ W. long.;	44°12.80′ N. lat., 124°17.18′ W. long.;	42°59.66′ N. lat., 124°32.58′ W. long.;
45°17.50′ N. lat., 124°04.91′ W. long.;	44°09.23′ N. lat., 124°15.96′ W. long.;	42°54.97′ N. lat., 124°36.99′ W. long.;
45°11.29′ N. lat., 124°05.20′ W. long.;	44°08.38′ N. lat., 124°16.79′ W. long.;	42°53.81′ N. lat., 124°38.57′ W. long.;
45°05.80′ N. lat., 124°05.40′ W. long.;	44°08.30′ N. lat., 124°16.75′ W. long.;	42°50.00′ N. lat., 124°39.68′ W. long.;
45°05.08′ N. lat., 124°05.93′ W. long.;	44°01.18′ N. lat., 124°15.42′ W. long.;	42°49.13′ N. lat., 124°39.70′ W. long.;
45°03.83′ N. lat., 124°06.47′ W. long.;	43°51.61′ N. lat., 124°14.68′ W. long.;	42°46.47′ N. lat., 124°38.89′ W. long.;
45°01.70′ N. lat., 124°06.53′ W. long.;	43°42.66′ N. lat., 124°15.46′ W. long.;	42°45.74′ N. lat., 124°38.86′ W. long.;
44°58.75′ N. lat., 124°07.14′ W. long.;	43°40.49′ N. lat., 124°15.74′ W. long.;	42°44.79′ N. lat., 124°37.96′ W. long.;
44°51.28′ N. lat., 124°10.21′ W. long.;	43°38.77′ N. lat., 124°15.64′ W. long.;	42°45.01′ N. lat., 124°36.39′ W. long.;
44°49.49′ N. lat., 124°10.90′ W. long.;	43°34.52′ N. lat., 124°16.73′ W. long.;	42°44.14′ N. lat., 124°35.17′ W. long.;
44°44.96′ N. lat., 124°14.39′ W. long.;	43°28.82′ N. lat., 124°19.52′ W. long.;	42°42.14′ N. lat., 124°32.82′ W. long.;
44°43.44′ N. lat., 124°14.78′ W. long.;	43°23.91′ N. lat., 124°24.28′ W. long.;	42°40.50′ N. lat., 124°31.98′ W. long.
44°42.26′ N. lat., 124°13.81′ W. long.;	43°20.83′ N. lat., 124°26.63′ W. long.;	

C.5. Inseason Management: Regulatory modifications may become necessary inseason to meet preseason management objectives such as quotas, harvest guidelines, and season duration. In addition to standard inseason actions or modifications already noted under the season description, the following inseason guidance is provided to NMFS:

a. Actions could include modifications to bag limits, or days open to fishing, and extensions or reductions in areas open to fishing.
b. Coho may be transferred inseason among recreational subareas north of Cape Falcon to help meet the recreational season duration objectives (for each subarea) after conferring with representatives of the affected ports and the Council's SAS recreational representatives north of Cape Falcon, and if the transfer would not result in exceeding preseason impact expectations on any stocks.
c. Chinook and coho may be transferred between the recreational and commercial fisheries north of Cape Falcon if there is agreement among the representatives of the SAS, and if the transfer would not result in exceeding preseason impact expectations on any stocks.
d. Fishery managers may consider inseason action modifying regulations restricting retention of unmarked (adipose fin intact) coho. To remain consistent with preseason expectations, any inseason action shall consider, if significant, the difference between observed and preseason forecasted (adipose-clipped) mark rates. Such a consideration may also include a change in bag limit of two salmon, no more than one of which may be a coho.
e. Marked coho remaining from the Cape Falcon to Humbug Mt. recreational mark-selective coho quota may be transferred inseason to the Cape Falcon to Humbug Mt. non-mark-selective recreational fishery if the transfer would not result in exceeding preseason impact expectations on any stocks.

C.6. Additional Seasons in State Territorial Waters: Consistent with Council management objectives, the States of Washington, Oregon, and California may establish limited seasons in state waters. Check state regulations for details.

TABLE V-3. 2018 Treaty Indian ocean troll management measures for ocean salmon fisheries - Council adopted.

A. SEASON DESCRIPTIONS
Supplemental Management Information
1. Overall Treaty-Indian TAC: 40,000 Chinook and 12,500 coho. 2. Overall Chinook and/or coho TACs may need to be reduced or fisheries adjusted to meet NMFS ESA guidance, FMP requirements, upon conclusion of negotiations in the North of Falcon forum, or upon receipt of preseason catch and abundance expectations for Canadian and Alaskan fisheries.
• May 1 through the earlier of June 30 or 16,000 Chinook quota. All salmon may be retained except coho. If the Chinook quota is exceeded, the excess will be deducted from the later all-salmon season (C.5). See size limit (B) and other restrictions (C). • July 1 through the earlier of September 15, or 24,000 Chinook quota, or 12,500 coho quota. All Salmon. See size limit (B) and other restrictions (C).

B. MINIMUM SIZE (Inches)

	Chinook		Coho		
Area (when open)	Total Length	Head-off	Total Length	Head-off	Pink
North of Cape Falcon	24.0 (61.0 cm)	18.0 (45.7 cm)	16.0 (40.6 cm)	12.0 (30.5 cm)	None

C. REQUIREMENTS, DEFINITIONS, RESTRICTIONS, OR EXCEPTIONS

C.1. Tribe and Area Boundaries. All boundaries may be changed to include such other areas as may hereafter be authorized by a Federal court for that tribe's treaty fishery.

S'KLALLAM - Washington State Statistical Area 4B (defined to include those waters of Puget Sound easterly of a line projected from the Bonilla Point light on Vancouver Island to the Tatoosh Island light, thence to the most westerly point on Cape Flattery and westerly of a line projected true north from the fishing boundary marker at the mouth of the Sekiu River [WAC 220-301-030]).
MAKAH - Washington State Statistical Area 4B and that portion of the FMA north of 48°02'15" N. lat. (Norwegian Memorial) and east of 125°44'00" W. long.

*QUILEUTE - A polygon commencing at Cape Alava, located at latitude 48°10'00" north, longitude 124°43'56.9" west; then proceeding west approximately forty nautical miles at that latitude to a northwestern point located at latitude 48°10'00" north, longitude 125°44'00" west; then proceeding in a southeasterly direction mirroring the coastline at a distance no farther than forty nautical miles from the mainland Pacific coast shoreline at any line of latitude, to a southwestern point at latitude 47°31'42" north, longitude 125°20'26" west; then proceeding east along that line of latitude to the Pacific coast shoreline at latitude 47°31'42" north, longitude 124°21'9.0" west.

HOH - That portion of the FMA between 47°54'18" N. lat. (Quillayute River) and 47°21'00" N. lat. (Quinault River) and east of 125°44'00" W. long.

*QUINAULT - A polygon commencing at the Pacific coast shoreline near Destruction Island, located at latitude 47°40'06" north, longitude 124°23'51.362" west; then proceeding west approximately thirty nautical miles at that latitude to a northwestern point located at latitude 47°40'06" north, longitude 125°08'30" west; then proceeding in a southeasterly direction mirroring the coastline no farther than thirty nautical miles from the mainland Pacific coast shoreline at any line of latitude, to a southwestern point at latitude 46°53'18" north, longitude 124°53'53" west; then proceeding east along that line of latitude to the pacific coast shoreline at latitude 46°53'18" north, longitude 124°7'36.6" west.

** On March 5, 2018, the Federal District Court for the Western District of Washington issued an order to revise the western U&A boundaries for the Quileute and Quinault Tribes. Most notably, the western boundaries are at set distances from the coast, rather than following a line of longitude.*

C.2. Gear restrictions
a. Single point, single shank, barbless hooks are required in all fisheries.
b. No more than eight fixed lines per boat.
c. No more than four hand held lines per person in the Makah area fishery (Washington State Statistical Area 4B and that portion of the FMA north of 48°02'15" N. lat. (Norwegian Memorial) and east of 125°44'00" W. long.)

TABLE V-4. Stock status relative to overfished and overfishing criteria. A stock is approaching an overfished condition if the 3-year geometric mean of the most recent two years and the forecast spawning escapement is less than the minimum stock size threshold (MSST); a stock would experience overfishing if the total annual exploitation rate exceeds the maximum fishing mortality threshold (MFMT). Occurrences of stocks *at risk of* approaching an overfished condition or experiencing overfishing are indicated in **bold**. 2019 spawning escapement and exploitation rate estimates are based on preliminary 2019 preseason abundance forecasts and 2018 Council regulations.

	Estimated Adult Spawning Escapement									Total Exploitation Rate						
	2014	2015	2016	2017	2018[a/]	Forecast 2019[b/]	3-yr Geo Mean	MSST	S_{MSY}	2014	2015	2016	2017	2018[a/]	2019[b/]	MFMT
Chinook																
Sacramento Fall	212,468	114,085	89,699	42,714	105,739	230,486	101,348	91,500	122,000	0.61	0.55	0.56	0.68	0.53	0.39	0.78
Klamath River Fall	95,104	28,112	13,937	19,904	53,624	58,729	39,724	30,525	40,700	0.36	0.59	0.37	0.10	0.28	0.33	0.71
Southern Oregon[c/]	53,546	30,462	27,278	91,977	39,497	NA	46,276	20,500	34,992	NA	NA	NA	NA	NA	NA	0.54
Central and Northern OR	157	247	118	114	92	NA	107	30 fish/mi	60 fish/mi	0.43	0.42	0.47	NA	NA	NA	0.78
Upper River Bright - Fall[d/]	233,934	323,276	151,373	97,789	58,540	62,215	70,884	19,182	39,625	0.53	0.40	0.51	NA	NA	NA	0.86
Upper River - Summer[d/]	77,982	88,691	79,253	56,265	38,816	33,084	41,651	6,072	12,143	0.69	0.67	0.63	NA	NA	NA	0.75
Willapa Bay - Fall[e/]	2,075	2,824	1,887	3,078	NA	NA	2,541	1,696	3,393	0.57	0.47	0.59	NA	NA	NA	0.78
Grays Harbor Fall[e/]	11,893	17,305	11,248	17,145	NA	NA	14,944	5,694	13,326	0.57	0.47	0.59	NA	NA	NA	0.78
Grays Harbor Spring	1,583	1,841	926	1,384	493	NA	858	700	1,400	NA	NA	NA	NA	NA	NA	0.78
Queets - Fall[d/]	3,820	5,313	2,915	2,702	NA	NA	3,472	1,250	2,500	0.57	0.47	0.59	NA	NA	NA	0.87
Queets - Sp/Su	377	532	704	NA	NA	NA	521	350	700	NA	NA	NA	NA	NA	NA	0.78
Hoh - Fall[e/]	1,933	1,795	2,831	1,808	NA	NA	2,094	600	1,200	0.57	0.47	0.59	NA	NA	NA	0.90
Hoh Sp/Su	744	1,070	1,144	1,364	NA	NA	1,186	450	900	NA	NA	NA	NA	NA	NA	0.78
Quillayute - Fall[e/]	2,782	3,440	3,654	3,604	4,031	NA	3,758	1,500	3,000	0.57	0.47	0.59	NA	NA	NA	0.87
Quillayute - Sp/Su	608	794	900	1,097	1,232	NA	1,067	600	1,200	NA	NA	NA	NA	NA	NA	0.78
Hoko -Su/Fa[d/]	1,760	2,877	1,324	1,188	2,179	NA	1,508	425	850	0.42	0.30	0.30	NA	NA	NA	0.78
Coho																
Willapa Bay	47,154	10,790	25,290	9,091	NA	50,124	22,587	8,600	17,200	0.51	0.44	0.38	0.33	NA	0.25	0.74
Grays Harbor	105,039	21,278	38,595	26,907	NA	57,788	39,151	18,320	24,426	0.45	0.49	0.12	0.32	NA	0.19	0.65
Queets	7,558	2,028	5,156	5,232	NA	9,331	6,314	4,350	5,800	0.41	0.26	0.15	0.23	NA	0.17	0.65
Hoh	4,565	1,794	5,009	4,478	NA	3,632	4,335	1,890	2,520	0.52	0.39	0.08	0.43	NA	0.48	0.65
Quillayute Fall	7,425	2,571	9,630	7,474	5,157	11,439	7,611	4,725	6,300	0.57	0.47	0.18	0.42	NA	0.22	0.59
Juan de Fuca	11,488	3,859	8,435	5,530	NA	8,314	7,292	7,000	11,000	0.17	0.18	0.03	0.06	NA	0.04	0.60
Hood Canal	26,787	26,926	24,313	22,519	NA	21,828	22,863	10,750	14,350	**0.68**	0.59	0.40	0.35	NA	0.46	0.65
Skagit	24,820	5,794	35,822	20,184	NA	40,551	30,836	14,875	25,000	0.52	**0.63**	0.20	0.09	NA	0.30	0.60
Stillaguamish	35,829	2,914	13,048	6,099	NA	16,420	10,933	6,100	10,000	0.27	0.48	0.16	0.12	NA	0.31	0.50
Snohomish	46,244	12,804	44,141	18,195	NA	42,477	32,433	31,000	50,000	0.31	0.55	0.18	0.21	NA	0.32	0.60

a/ Preliminary.

b/ Preliminary approximations based on preseason forecasts and the previous year fishing regulations.

c/ MSST 18,440 (20,500 as measured at Huntley Park).

d/ CWT based exploitation rates from annual catch and escapement distribution from PSC-CTC 2013 Exploitation Rate Analysis.

e/ Queets River fall Chinook CWT exploitation rates used as a proxy. Exploitation rates in the terminal fisheries will differ from those calculated for Queets fall CWTs.

TABLE V-5. Postseason S_{ACL}, S_{OFL}, and spawner escapement estimates for Sacramento River fall Chinook (SRFC), Klamath River fall Chinook (KRFC) and Willapa Bay coho. For the current year, S_{ACL} and S_{OFL} are preseason values. Current year spawner escapements are preseason values based on current abundance forecasts and the previous year fishing regulations.

	SRFC			KRFC			Willapa Bay Coho		
Year	S_{ACL} [a/]	S_{OFL}	Escapement [b/]	S_{ACL} [a/]	S_{OFL}	Escapement [c/]	S_{ACL} [a/]	S_{OFL}	Escapement [c/]
2012	188,405	138,164	285,429	70,946	64,295	121,543	--	--	--
2013	260,867	191,302	406,846	52,021	47,144	59,156	--	--	--
2014	165,358	121,262	212,468	47,673	43,204	95,104	--	--	--
2015	76,670	56,225	114,085	22,209	20,127	28,112	9,183	7,958	17,086
2016	61,595	45,170	89,699	7,066	6,403	13,937	14,780	12,810	30,667
2017	40,636	29,800	42,714	7,111	6,444	19,904	9,183	7,958	10,878
2018	67,156	49,248	105,739	23,794	21,563	53,624	NA	NA	NA
2019	113,890	83,519	230,486	28,126	25,489	58,729	27,553	23,879	71,734

a/ $S_{ACL} = S_{ABC.}$

b/ Hatchery and natural area adult spawners.

c/ Natural area adult spawners.

TABLE V-6. Comparison of projected ocean escapements and exploitation rates for critical natural and Columbia River hatchery coho stocks (thousands of fish) resulting from application of 2018 Council-adopted regulations to 2018 and 2019 ocean abundance forecasts.[a/]

	Ocean Escapement and ER Estimates Under 2018 Regulations [b/]				
	2018 Abundance Forecasts		2019 Abundance Forecasts		
Stock	Ocean Escapement	Exploitation Rate	Ocean Escapement	Exploitation Rate	2019 FMP Conservation Objective [c/]
Natural Coho Stocks					
Skagit	57.0	31.3%	56.2	30.3%	Exploitation Rate ≤35.0% [d/]
Stillaguamish	18.5	34.5%	23.4	31.2%	Exploitation Rate ≤50.0% [d/]
Snohomish	64.3	33.5%	61.5	32.3%	Exploitation Rate ≤40.0% [d/]
Hood Canal	57.0	42.5%	38.8	45.7%	Exploitation Rate ≤45.0% [d/]
Strait of Juan de Fuca	6.9	6.7%	8.6	5.7%	Exploitation Rate ≤20.0% [d/]
Quillayute Fall	10.1	23.5%	14.3	22.4%	6.3 - 15.8 Spawners
Hoh	5.2	49.7%	6.5	48.0%	2.0 - 5.0 Spawners
Queets	6.1	19.6%	10.1	16.5%	5.8 - 14.5 Spawners
Grays Harbor	40.5	20.7%	69.4	19.4%	35.4 Spawners
LCN	19.1	16.2%	35.3	8.6%	Exploitation Rate ≤23.0 [e/]
OCN	48.1	12.9%	71.6	6.1%	Exploitation Rate ≤15.0% [e/]
R/K	2.5	5.5%	12.9	2.4%	Exploitation Rate ≤13.0% [e/]
Hatchery Coho Stocks					
Columbia Early	105.1	59.9%	472.7	42.2%	6.2 Hatchery Escapement
Columbia Late	81.0	43.6%	311.2	26.4%	14.2 Hatchery Escapement

a/ Quota levels include harvest and hooking mortality estimates used in planning the Council's 2018 ocean fisheries and a coho catch for the Canadian troll fishery off the West Coast of Vancouver Island (WCVI).

b/ 2018 preseason regulations with the following coho quotas: U.S. Canada Border to Cape Falcon: Treaty Indian troll-12,500; non-Indian troll-5,600 selective; recreational-42,000 selective; Cape Falcon to OR/CA border: recreational-35,000 selective and 3,500 non-selective; troll-none. Ocean escapement is generally the estimated number of coho escaping ocean fisheries and entering freshwater. For Puget Sound stocks, ocean escapement is the total abundance minus ocean fisheries (ie outside Puget Sound). For the OCN coho stock, this value represents the estimated spawner escapement in SRS accounting. For Columbia R. hatchery and LCN stocks, ocean escapement represents the number of coho after the Buoy 10 fishery; the LCN exploitation rates shown are total marine and mainstem Columbia R. fishery ERs. The 2019 marine fisheries exploitation rates are forecast at 4.0% compared to 9.9% in 2018; the total 2018 ESA limit was 18.0% including mainstem Columbia R. fisheries.

c/ Goals represent FMP conservation objectives, ESA consultation standards, or hatchery escapement needs. Spawning escapement goals are not directly comparable to ocean escapement because the latter occur before inside fisheries.

d/ Assumed exploitation rate based on preliminary abundance forecasts.

e/ Pending confirmation of 2019 ESA consultation standard.

TABLE V-7. Comparison of Lower Columbia natural (LCN), Oregon coastal natural (OCN), and Rogue/Klamath (RK) coho projected harvest mortality and exploitation rates by fishery under Council-adopted 2018 management measures and preliminary 2019 preseason abundance estimates.

	Projected Harvest Mortality and Exploitation Rate					
	LCN		OCN		RK[a/]	
Fishery	Number	Percent	Number	Percent	Number	Percent
SOUTHEAST ALASKA	0	0.0%	0	0.0%	0	0.0%
BRITISH COLUMBIA	54	0.1%	327	0.4%	42	0.3%
PUGET SOUND/STRAITS	37	0.1%	23	0.0%	0	0.0%
NORTH OF CAPE FALCON						
Recreational	435	1.2%	160	0.2%	3	0.0%
Treaty Indian Troll	214	0.6%	100	0.1%	0	0.0%
Non-Indian Troll	162	0.4%	78	0.1%	0	0.0%
SOUTH OF CAPE FALCON						
Recreational:						
Cape Falcon to Humbug Mt.	477	1.3%	2,133	2.8%	22	0.2%
Humbug Mt. to Horse Mt. (KMZ)	11	0.0%	121	0.2%	75	0.6%
Fort Bragg	3	0.0%	44	0.1%	26	0.2%
South of Pt. Arena	0	0.0%	25	0.0%	11	0.1%
Troll:						
Cape Falcon to Humbug Mt.	66	0.2%	178	0.2%	5	0.0%
Humbug Mt. to Horse Mt. (KMZ)	17	0.0%	226	0.3%	115	0.9%
Fort Bragg	0	0.0%	29	0.0%	11	0.1%
South of Pt. Arena	1	0.0%	38	0.0%	3	0.0%
BUOY 10	272	0.7%	37	0.0%	0	0.0%
ESTUARY/FRESHWATER	1,441	3.9%	1,166	1.5%	NA	NA
TOTAL	3,190	8.6%	4,685	6.1%	313	2.4%

a/ Unmarked hatchery production used as a surrogate for Rogue/Klamath natural stock coho.

TABLE V-8 Maximum allowable fishery impact rate for OCN coho under Amendment 13 matrix and the revised OCN work group matrix based on parent escapement levels by stock component and marine survival category.[a/]

	OCN Coho Spawners by Stock Component				Marine Survival Indicator		Amendment 13 Matrix			OCN Work Group Matrix[a/]		
Fishery Year (t)	Parent Spawner Year (t-3)	Northern	North-Central	South-Central	Hatchery Jack Survival	Predicted OCN Adult Survival	Marine Survival Category	Parental Spawner Category	Maximum Allowable Impacts	Marine Survival Category[b/c/]	Parental Spawner Category	Maximum Allowable Impacts
1998	1995	3,900	13,600	36,500	0.04%	-	Low	Very Low	≤10-13%	Extremely Low	Very Low	≤8%
1999	1996	3,300	18,100	52,600	0.10%	-	Med	Very Low	≤15%	Low	Critical	0-8%
2000	1997	2,100	2,800	18,400	0.12%	-	Med	Very Low	≤15%	Low	Critical	0-8%
2001	1998	2,600	3,300	25,900	0.27%	-	Med	Very Low	≤15%	Medium	Critical	0-8%
2002	1999	8,900	11,800	29,200	0.09%	-	Med	Low	≤15%	Low	Low	≤15%
2003	2000	17,900	14,300	36,500	0.20%	-	Med	Low	≤15%	Med	Low	≤15%
2004	2001	33,500	25,200	112,000	0.14%	-	Med	Low	≤15%	Med	Low	≤15%
2005	2002	52,500	104,000	104,100	0.11%	-	Med	High	≤20%	Low	High	≤15%
2006	2003	59,600	68,900	99,800	0.12%	-	Med	High	≤20%	Low	High	≤15%
2007	2004	28,800	42,100	101,900	0.17%	-	Med	Med	≤20%	Med	Med	≤20%
2008	2005	16,500	51,400	86,700	0.07%	-	Low	High	≤15%	Extremely Low	High	≤8%
2009	2006	24,100	21,200	83,500	0.27%	-	Med	Low	≤15%	Med	Low	≤15%
2010	2007	17,500	12,300	36,500	0.12%	-	Med	Low	≤15%	Low	Low	≤15%
2011	2008	25,600	68,100	86,000	0.12%	-	Med	High	≤20%	Low	High	≤15%
2012	2009	48,100	86,400	128,200	0.09%	-	Med	High	≤20%	Low	High	≤15%
2013	2010	55,000	56,500	171,900	0.14%	6.8%	Med	High	≤20%	Med	High	≤30%
2014	2011	45,900	119,100	191,300	0.26%	7.1%	Med	High	≤20%	Med	High	≤30%
2015	2012	7,500	33,800	57,800	0.20%	7.5%	Med	Low	≤15%	Med	Low	≤15%
2016	2013	11,000	39,700	73,700	0.10%	6.2%	Med	Med	≤20%	Med	Med	≤20%
2017	2014	67,400	121,900	170,400	0.13%	5.6%	Med	High	≤30%	Med	High	≤30%
2018	2015	6,700	22,700	27,700	0.11%	4.3%	Low	Low	≤15%	Low	Low	≤15%
2019	2016	18,700	26,500	30,700	0.27%	3.80%	Low	Low	≤15%	Low	Low	≤15%
2020	2017	13,600	22,800	24,900	-	-	-	Low	-	-	Low	-
2021	2018	7,700	22,100	41,300	-	-	-	Low	-	-	Low	-

a/ Developed by the OCN Coho Work Group as a result of the 2000 Review of Amendment 13. See Appendix A, tables A-2 and A-4 for details

b/ OCN workgroup matrix was modified during the 2012 methodology review. For 2013, the marine survival category is determined by a predicted OCN adult survival rate that is based on th natural smolt to jack relationship at Mill Creek in the Yaquina River basin.

c/ OCN workgroup matrix was modified during the 2013 methodology review. Beginning in 2014, the marine survival category is determined by a predicted OCN adult survival rate that is based on biologic and oceanographic indicators.

CHAPTER VI: REFERENCES

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APPENDIX A
SUMMARY OF COUNCIL STOCK MANAGEMENT GOALS

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TABLE A-1. Conservation objectives and reference points governing harvest control rules and status determination criteria for salmon stocks and stock complexes[a/] (Page 1 of 7)

CHINOOK					
Stocks In The Fishery	**Conservation Objective**	S_{MSY}	MSST	MFMT (F_{MSY})	ACL
Sacramento River Fall Indicator stock for the Central Valley fall (CVF) Chinook stock complex.	122,000-180,000 natural and hatchery adult spawners (MSY proxy adopted 1984). This objective is intended to provide adequate escapement of natural and hatchery production for Sacramento and San Joaquin fall and late-fall stocks based on habitat conditions and average run-sizes as follows: Sacramento River 1953-1960; San Joaquin River 1972-1977 (ASETF 1979; PFMC 1984; SRFCRT 1994). The objective is less than the estimated basin capacity of 240,000 spawners (Hallock 1977), but greater than the 118,000 spawners for maximum production estimated on a basin by basin basis before Oroville and Nimbus Dams (Reisenbichler 1986).	122,000	91,500	78% Proxy (SAC 2011a)	Based on F_{ABC} and annual ocean abundance. F_{ABC} is F_{MSY} reduced by Tier 2 (10%) uncertainty
Sacramento River Spring ESA Threatened	NMFS ESA consultation standard/recovery plan: Conform to Sacramento River Winter Chinook ESA consultation standard (no defined objective for ocean management prior to listing).	Undefined	Undefined	Undefined	ESA consultation standard applies.
Sacramento River Winter ESA Endangered	NMFS ESA consultation standard/recovery plan: Recreational seasons: Point Arena to Pigeon Point between the first Saturday in April and the second Sunday in November; Pigeon Point to the U.S./Mexico Border between the first Saturday in April and the first Sunday in October. Minimum size limit ≥ 20 inches total length. Commercial seasons: Point Arena to the U.S./Mexico border between May 1 and September 30, except Point Reyes to Point San Pedro between October 1 and 15 (Monday through Friday). Minimum size limit ≥ 26 inches total length. In addition to these season and minimum size limit restrictions, annual limits to the preseason-predicted age-3 impact rate south of Point Arena, defined by a control rule, were implemented beginning in 2012 and updated in 2018 (See Figure A-3).	Undefined	Undefined	Undefined	
California Coastal Chinook ESA Threatened	NMFS ESA consultation standard/recovery plan: Limit ocean fisheries to no more than a 16.0% age-4 ocean harvest rate on Klamath River fall Chinook.	Undefined	Undefined	Undefined	
Klamath River Fall Indicator stock for the Southern Oregon Northern California (SONC) Chinook stock complex.	At least 32% of potential adult natural spawners, but no fewer than 40,700 naturally spawning adults in any one year. Brood escapement rate must average at least 32% over the long-term, but an individual brood may vary from this range to achieve the required tribal/nontribal annual allocation. Natural area spawners to maximize catch estimated at 40,700 adults (STT 2005).	40,700	30,525	71% (STT 2005)	Based on F_{ABC} and annual ocean abundance. F_{ABC} is F_{MSY} reduced by Tier 1 (5%) uncertainty
Klamath River - Spring	Undefined	Undefined	Undefined	Undefined	Component stock of SONC complex; ACL indicator stock is KRFC
Smith River	Undefined	Undefined	Undefined	78% Proxy (SAC 2011a)	
Southern Oregon	At least 41,000 naturally-produced adults passing Huntley Park in the Rogue River to provide MSY spawning escapement. (PFMC 2015)	34,992	20,500	54% (PFMC 2015)	

TABLE A-1. Conservation objectives and reference points governing harvest control rules and status determination criteria for salmon stocks and stock complexes.[a/] (Page 2 of 7)

CHINOOK						
Stocks In The Fishery	**Conservation Objective**		S_{MSY}	MSST	MFMT (F_{MSY})	ACL
Central and Northern Oregon	Unspecified portion of an aggregate 150,000 to 200,000 natural adult spawners for Oregon coast (Thompson 1977 and McGie 1982) measured by 60-90 fish per mile in index streams. ODFW developing specific conservation objectives for spring and fall stocks that may be implemented without plan amendment upon approval by the Council.		60 Fish per mile in index streams	30 Fish per mile in index streams	78% Proxy (SAC 2011a)	Component stock(s) of FNMC complex; international exception applies, ACLs are not applicable.
Willapa Bay Fall	Undetermined in FMP. WDFW spawning escapement objective of 4,350.		3,393	1,697	78% Proxy (SAC 2011a)	
Grays Harbor Fall Indicator stock for the Far North Migrating Coastal (FNMC) Chinook stock complex	13,326 natural adult spawners in the Chehalis and Humptulips Rivers combined. (PFMC 2015)	Annual natural spawning escapement targets may vary from FMP conservation objectives if agreed to by WDFW and treaty tribes under the provisions of *Hoh v. Baldrige* and subsequent U.S. District Court orders.	13,326	6,663	63% (PFMC 2015)	FNMC complex; international exception applies, ACLs are not applicable.
Queets Fall Indicator stock for the FNMC Chinook stock complex	Manage terminal fisheries for 40% harvest rate, but no less than 2,500 natural adult spawners, the MSY level estimated by Cooney (1984).		2,500	1,250	87% (Cooney 1984)	
Hoh Fall Indicator stock for the FNMC Chinook stock complex	Manage terminal fisheries for 40% harvest rate, but no less than 1,200 natural adult spawners, the MSY level estimated by Cooney (1984).		1,200	600	90% (Cooney 1984)	
Quillayute Fall Indicator stock for the FNMC Chinook stock complex	Manage terminal fisheries for 40% harvest rate, but no less than 3,000 natural adult spawners, the MSY level estimated by Cooney (1984).		3,000	1,500	87% (Cooney 1984)	
Hoko Summer/Fall Indicator stock for the FNMC Chinook stock complex	850 natural adult spawners, the MSP level estimated by Ames and Phinney (1977). May include adults used for supplementation program.		850	425	78% Proxy (SAC 2011a)	
Grays Harbor Spring	1,400 natural adult spawners.		1,400	700	78% Proxy (SAC 2011a)	FNMC complex; international exception applies, ACLs are not applicable.
Queets Sp/Su	Manage terminal fisheries for 30% harvest rate, but no less than 700 natural adult spawners.		700	350	78% Proxy (SAC 2011a)	
Hoh Spring/Summer	Manage terminal fisheries for 31% harvest rate, but no less than 900 natural adult spawners.		900	450	78% Proxy (SAC 2011a)	
Quillayute Spring/Summer	1,200 natural adult spawners for summer component (MSY).		1,200	600	78% Proxy (SAC 2011a)	
Willapa Bay Fall (hatchery)	WDFW spawning escapement objective of 3,525 hatchery spawners		Not applicable to hatchery stocks			
Quinault Fall (hatchery)	Hatchery production.					

TABLE A-1. Conservation objectives and reference points governing harvest control rules and status determination criteria for salmon stocks and stock complexes.[a/] (Page 3 of 7)

CHINOOK					
Stocks In The Fishery	**Conservation Objective**	S_{MSY}	MSST	MFMT (F_{MSY})	ACL
North Lewis River Fall	NMFS consultation standard/recovery plan. McIsaac (1990) stock-recruit analysis supports MSY objective of 5,700 natural adult spawners.	5,700	ESA consultation standard applies.	76%	ESA consultation standard applies.
Snake River Fall	NMFS consultation standard/recovery plan. No more than 70.0% of 1988-1993 base period AEQ exploitation rate for all ocean fisheries.	Undefined		Undefined	
Upper Willamette Spring	NMFS consultation standard/recovery plan. Not applicable for ocean fisheries.	Undefined		Undefined	
Columbia Upper River Spring	NMFS consultation standard/recovery plan. Not applicable for ocean fisheries.	Undefined		Undefined	
Snake River - Spring/Summer	NMFS consultation standard/recovery plan. Not applicable for ocean fisheries.	Undefined		Undefined	
Columbia Lower River Hatchery - Fall	14,800 adults for hatchery egg-take. River mouth goal of 25,000.	Not applicable to hatchery stocks			
Columbia Lower River Hatchery Spring	3,500 adults to meet Cowlitz, Kalama, and Lewis Rivers broodstock needs.				
Columbia Mid-River Bright Hatchery Fall	7,900 for Little White Salmon Hatchery egg-take.				
Columbia Spring Creek Hatchery Fall	6,000 adults to meet hatchery egg-take goal.				
Columbia Upper River Bright Fall	40,000 natural bright adults above McNary Dam (MSY proxy adopted in 1984 based on CRFMP). The management goal has been increased to 60,000 by Columbia River managers in recent years.	39,625 (Langness and Reidinger 2003)	19,812	85.91% (Langness and Reidinger 2003)	International exception applies, ACLs are not applicable.
Columbia Upper River Summer	Hold ocean fishery impacts at or below base period; recognize CRFMP objective - MSY proxy of 80,000 to 90,000 adults above Bonneville Dam, including both Columbia and Snake River stocks (state and tribal management entities considering separate objectives for these stocks).	12,143 (CTC 1999)	6,071	75% (CTC 1999)	

TABLE A-1. Conservation objectives and reference points governing harvest control rules and status determination criteria for salmon stocks and stock complexes.[a/] (Page 4 of 7)

CHINOOK						
Stocks In The Fishery	**Conservation Objective**		S_{MSY}	MSST	MFMT (F_{MSY})	ACL
Eastern Strait of Juan de Fuca Summer/Fall	NMFS consultation standard/recovery plan.	Annual natural spawning escapement targets may vary from FMP conservation objectives if agreed to by WDFW and treaty tribes under the provisions of *U.S. v. Washington* and subsequent U.S. District Court orders.	Undefined	ESA consultation standard applies	Undefined	ESA Consultation standard applies.
Skokomish Summer/Fall	NMFS consultation standard/recovery plan.		Undefined		Undefined	
Mid Hood Canal Summer/Fall	NMFS consultation standard/recovery plan.		Undefined		Undefined	
Nooksack Spring early	NMFS consultation standard/recovery plan.		Undefined		Undefined	
Skagit Summer/Fall	NMFS consultation standard/recovery plan.		Undefined		Undefined	
Skagit Spring	NMFS consultation standard/recovery plan.		Undefined		Undefined	
Stillaguamish Summer/Fall	NMFS consultation standard/recovery plan.		Undefined		Undefined	
Snohomish Summer/Fall	NMFS consultation standard/recovery plan.		Undefined		Undefined	
Cedar River Summer/Fall	NMFS consultation standard/recovery plan.		Undefined		Undefined	
White River Spring	NMFS consultation standard/recovery plan.		Undefined		Undefined	
Green River Summer/Fall	NMFS consultation standard/recovery plan.		Undefined		Undefined	
Nisqually River Summer/Fall	NMFS consultation standard/recovery plan.		Undefined		Undefined	
Puyallup Summer/Fall	NMFS consultation standard/recovery plan.		Undefined		Undefined	

TABLE A-1.Conservation objectives and reference points governing harvest control rules and status determination criteria for salmon stocks and stock complexes.[a/] (Page 5 of 7)

COHO					
Stocks In The Fishery	**Conservation Objective**	S_{MSY}	MSST	MFMT (F_{MSY})	ACL
Central California Coast ESA Threatened	NMFS ESA consultation standard/recovery plan: No retention of coho south of the OR/CA border.	Undefined	ESA consultation standard applies	Undefined	ESA consultation standard applies.
Southern Oregon/Northern California Coast ESA Threatened	NMFS ESA consultation standard/recovery plan: No more than a 13.0% AEQ exploitation rate in ocean fisheries on Rogue/Klamath hatchery coho.	Undefined		Undefined	
Oregon Coastal Natural ESA Threatened	NMFS ESA consultation standard/recovery plan: Total AEQ exploitation rate limit based on parental seeding level and marine survival matrix in FMP Table 3-2.	Undefined		Undefined	
Lower Columbia Natural ESA Threatened	NMFS ESA consultation standard/recovery plan: AEQ exploitation rate limit on ocean and mainstem Columbia fisheries identified in annual NMFS guidance.	Undefined		Undefined	
Oregon Coast Hatchery	Hatchery production.	Not applicable to hatchery stocks			
Columbia River Late Hatchery	Hatchery rack return goal of 6,400 adults. River mouth goal of 9,700.				
Columbia River Early Hatchery	Hatchery rack return goal of 21,700 adults. River mouth goal of 77,200.				
Willapa Bay - Hatchery	Hatchery rack return goal of 6,100 adults.				
Quinault - Hatchery	Hatchery production.				
Quillayute - Summer Hatchery	Hatchery production.				
South Puget Sound Hatchery	Hatchery rack return goal of 52,000 adults.				
Willapa Bay Natural	17,200 natural area spawners.	17,200	8,600	74%	Based on F_{ABC} and annual ocean abundance. F_{ABC} is F_{MSY} reduced by Tier 1 (5%) uncertainty

TABLE A-1. Conservation objectives and reference points governing harvest control rules and status determination criteria for salmon stocks and stock complexes.[a/] (Page 6 of 7)

COHO						
Stocks In The Fishery	**Conservation Objective**		S_{MSY}	MSST	MFMT (F_{MSY})	ACL
Grays Harbor	35,400 natural adult spawners (MSP based on WDF [1979])	Annual natural spawning escapement targets may vary from FMP conservation objectives if agreed to by WDFW and treaty tribes under the provisions of Hoh v. Baldrige, U.S. v. Washington, or subsequent U.S. District Court orders	24,426 S_{MSP} (FMP) *F_{SMY} (SAC 2010b)	18,320 (Johnstone et al. 2011)	MFMT=65% (Johnstone et al. 2011) F_{MSY}=69% (SAC 2011b)	International exception applies, ACLs are not applicable.
Queets	MSY range of 5,800 to 14,500 natural adult spawners (Lestelle et al 1984)		5,800 (Johnston et al. 2011)	4,350 (Johnstone et al. 2011)	MFMT=65% (Johnstone et al. 2011) F_{MSY}=68% (SAC 2011b)	
Hoh	MSY range of 2,000 to 5,000 natural adult spawners (Lestelle et al. 1984)		2,520 (SAC 2010b)	1,890 S_{MSY}*0.75	MFMT=65% (Johnstone et al. 2011) F_{MSY}=69% (SAC 2011b)	
Quillayute - Fall	MSY range of 6,300 to 15,800 natural adult spawners (Lestelle et al. 1984)		6,300 (Johnston et al. 2011)	4,725 (Johnstone et al. 2011)	MFMT=59%; F_{MSY}=59% (SAC 2011b)	
Strait of Juan de Fuca	Total allowable MSY exploitation rate of: 0.60 for ocean age-3 abundance > 27,445; 0.40 for ocean age-3 abundance >11,679 and ≤27,445; 0.20 for ocean age-3 abundance ≤11,679		11,000 (Bowhay et al. 2009)	7,000 (Bowhay et al. 2009)	60% (Bowhay et al. 2009)	
Hood Canal	Total allowable MSY exploitation rate of: 0.65 for ocean age-3 abundance > 41,000; 0.45 for ocean age-3 abundance >19,545 and ≤41,000; 0.20 for ocean age-3 abundance ≤19,545		14,350 (Bowhay et al. 2009)	10,750 (Bowhay et al. 2009)	65% (Bowhay et al. 2009)	
Skagit	Total allowable MSY exploitation rate of: 0.60 for ocean age-3 abundance > 62,500; 0.35 for ocean age-3 abundance >22,857 and ≤62,500; 0.20 for ocean age-3 abundance ≤22,857		25,000 (Bowhay et al. 2009)	14,857 (Bowhay et al. 2009)	60% (Bowhay et al. 2009)	
Stillaguamish	Total allowable MSY exploitation rate of: 0.50 for ocean age-3 abundance > 20,000; 0.35 for ocean age-3 abundance >9,385 and ≤20,000; 0.20 for ocean age-3 abundance ≤9,385		10,000 (Bowhay et al. 2009)	6,100 (Bowhay et al. 2009)	50% (Bowhay et al. 2009)	
Snohomish	Total allowable MSY exploitation rate of: 0.60 for ocean age-3 abundance > 125,000; 0.40 for ocean age-3 abundance >51,667 and ≤125,000; 0.20 for ocean age-3 abundance ≤51,667		50,000 (Bowhay et al. 2009)	31,000 (Bowhay et al. 2009)	60% (Bowhay et al. 2009)	

TABLE A-1. Conservation objectives and reference points governing harvest control rules and status determination criteria for salmon stocks and stock complexes.[a/] (Page 7 of 7)

PINK (odd-numbered years)					
Stocks In The Fishery	**Conservation Objective**	S_{MSY}	MSST	MFMT (F_{MSY})	ACL
Puget Sound	900,000 natural spawners or consistent with provisions of the Pacific Salmon Treaty (Fraser River Panel).	900,000	450,000	Undefined	International exception applies, ACLs are not applicable.

a/ Some hatchery goals and ESA consultation standards have been updated relative to the version of this table in the FMP.

TABLE A-2. Allowable fishery impact rate criteria for OCN coho stock components under the Salmon Fishery Management Plan Amendment 13.

		MARINE SURVIVAL INDEX (based on return of jacks per hatchery smolt)		
		Low (<0.0009)	**Medium** (0.0009 to 0.0034)	**High** (>0.0034)
PARENT SPAWNER STATUS		**Allowable Total Fishery Impact Rate**		
High:	Parent spawners achieved Level #2 rebuilding criteria; grandparent spawners achieved Level #1	≤15%	≤30% [a/]	≤35%[a/]
Medium:	Parent spawners achieved Level #1 or greater rebuilding criteria	≤15%	≤20%[a/]	≤25%[a/]
Low:	Parent spawners less than Level #1 rebuilding criteria	≤15% ≤10-13%[b/]	≤15%	≤15%

	OCN Coho Spawners by Stock Component				
Rebuilding Criteria	**Northern**	**North-Central**	**South-Central**	**Southern**	**Total**
Full Seeding at Low Marine Survival:	21,700	55,000	50,000	5,400	132,100
Level #2 (75% of full seeding):	16,400	41,300	37,500	4,100	99,300
Level #1 (50% of full seeding):	10,900	27,500	25,000	2,700	66,100
38% of Level #1 (19% of full seeding):	4,100	10,500	9,500	1,000	25,100

Stock Component (Boundaries)	**Full Seeding of Major Basins at Low Marine Survival (Number of Adult Spawners)**				
Northern: (Necanicum River to Neskowin Creek)	Nehalem	Tillamook	Nestucca	Ocean Tribs.	
	17,500	2,000	1,800	400	
North-Central: (Salmon River to Siuslaw River)	Siletz	Yaquina	Alsea	Siuslaw	Ocean Tribs.
	4,300	7,100	15,100	22,800	5,700
South-Central: (Siltcoos River to Sixes River)	Umpqua	Coos	Coquille	Coastal Lakes	
	29,400	7,200	5,400	8,000	
Southern: (Elk River to Winchuck River)	Rogue				
	5,400				

a/ When a stock component achieves a medium or high parent spawner status under a medium or high marine survival index, but a major basin within the stock component is less than 10% of full seeding, (1) the parent spawner status will be downgraded one level to establish the allowable fishery impact rate for that component, and (2) no coho-directed harvest impacts will be allowed within that particular basin.

b/ This exploitation rate criteria applies when (1) parent spawners are less than 38% of the Level #1 rebuilding criteria, or (2) marine survival conditions are projected to be at an extreme low as in 1994-1996 (<0.0006 jack per hatchery smolt). If parent spawners decline to lower levels than observed through 1998, rates of less than 10% would be considered, recognizing that there is a limit to further bycatch reduction opportunities.

TABLE A-3. Fishery impact rate criteria for OCN coho stock components based on the harvest matrix resulting from the OCN work group 2000 review of Amendment 13.

Parent Spawner Status [a/]	Marine Survival Index (based on return of jacks per hatchery smolt)			
	Extremely Low (<0.0008)	**Low** (0.0008 to 0.0014)	**Medium** (>0.0014 to 0.0040)	**High** (>0.0040)
High Parent Spawners > 75% of full seeding	**E** ≤ 8%	**J** ≤ 15%	**O** ≤ 30%	**T** ≤ 45%
Medium Parent Spawners > 50% & ≤ 75% of full seeding	**D** ≤ 8%	**I** ≤ 15%	**N** ≤ 20%	**S** ≤ 38%
Low Parent Spawners > 19% & ≤ 50% of full seeding	**C** ≤ 8%	**H** ≤ 15%	**M** ≤ 15%	**R** ≤ 25%
Very Low Parent Spawners > 4 fish per mile & ≤ 19% of full seeding	**B** ≤ 8%	**G** ≤ 11%	**L** ≤ 11%	**Q** ≤ 11%
Critical [b/] Parental Spawners ≤ 4 fish per mile	**A** 0 - 8%	**F** 0 - 8%	**K** 0 - 8%	**P** 0 - 8%

Sub-aggregate and Basin Specific Spawner Criteria Data

Sub-aggregate	Miles of Available Spawning Habitat	100% of Full Seeding	"Critical"		Very Low, Low, Medium & High		
			4 Fish per Mile	12% of Full Seeding	19% of Full Seeding	50% of Full Seeding	75% of full Seeding
Northern	899	21,700	3,596	NA	4,123	10,850	16,275
North - Central	1,163	55,000	4,652	NA	10,450	27,500	41,250
South - Central	1,685	50,000	6,740	NA	9,500	25,000	37,500
Southern	450	5,400	NA	648	1,026	2,700	4,050
Coastwide Total	4,197	132,100	15,636		25,099	66,050	99,075

a/ Parental spawner abundance status for the OCN aggergate assumes the status of the weakest sub-aggregate.

b/ "Critical" parental spawner status is defined as 4 fish per mile for the Northern, North-Central, and South-Central subaggergates. Because the ratio of high quality spawning habitat to total spawning habitat in the Rogue River Basin differs significantly from the rest of the basins on the coast, the spawner density of 4 fish per mile does not represent "Critical" status for that basin. Instead. "Critical" status for the Rogue Basin (Southern Sub-aggergate) is estimated as 12% of full seeding of high quality

TABLE A-4. Fishery impact rate criteria for OCN coho stock components based on the harvest matrix resulting from the OCN work group 2000 review of Amendment 13 including modifications to the marine survival index adopted during the 2012 and 2013 methodology reviews.

Parent Spawner Status[a/]	**Marine Survival Index** *(Wild adult coho salmon survival as predicted by the two-variable GAM ensemble forecast)*			
	Extremely Low *<2%*	**Low** *2%-4.5%*	**Medium** *>4.5%-8%*	**High** *>8%*
High Parent Spawners > 75% of full seeding	E ≤ 8%	J ≤ 15%	O ≤ 30%	T ≤ 45%
Medium Parent Spawners > 50% & ≤ 75% of full seeding	D ≤ 8%	I ≤ 15%	N ≤ 20%	S ≤ 38%
Low Parent Spawners > 19% & ≤ 50% of full seeding	C ≤ 8%	H ≤ 15%	M ≤ 15%	R ≤ 25%
Very Low Parent Spawners > 4 fish per mile & ≤ 19% of full seeding	B ≤ 8%	G ≤ 11%	L ≤ 11%	Q ≤ 11%
Critical Parent Spawners ≤4 fish per mile	A 0 – 8%	F 0 – 8%	K 0 – 8%	P 0 – 8%

Sub-aggregate and Basin Specific Spawner Criteria Data

Sub-aggregate	Miles of Available Spawning Habitat	100% of Full Seeding	"Critical"		Very Low, Low, Medium & High		
			4 Fish per Mile	12% of Full Seeding	19% of Full Seeding	50% of Full Seeding	75% of Full Seeding
Northern	899	21,700	3,596	NA	4,123	10,850	16,275
North-Central	1,163	55,000	4,652	NA	10,450	27,500	41,250
South-Central	1,685	50,000	6,740	NA	9,500	25,000	37,500
Southern *(Removed per adoption of Amendment 16)*							
Coastwide Total	*3,747*	*126,700*	*14,988*		*24,073*	*63,350*	*95,025*

a/ Parental spawner abundance status for the OCN aggregate assumes the status of the weakest sub-aggregate.

TABLE A-5. Council adopted management objectives for Puget Sound natural coho management units, expressed as exploitation rate ceilings for critical, low and normal abundance based status categories, with runsize breakpoints (abundances expressed as ocean age-3).

Status	Management Unit				
	Strait of Juan de Fuca	Hood Canal	Skagit	Stillaguamish	Snohomish
Critical/Low Runsize Breakpoint	11,679	19,545	22,857	9,385	51,667
Critical Exploitation Rate	0.20	0.20	0.20	0.20	0.20
Low/normal runsize breakpoint	27,445	41,000	62,500	20,000	125,000
Low Exploitation Rate	0.40	0.45	0.35	0.35	0.40
Normal Exploitation Rate	0.60	0.65	0.60	0.50	0.60

TABLE A-6. Council recommended management objectives for Lower Columbia River natural tule Chinook, expressed as exploitation rate ceilings for abundance based status categories, with runsize forecast bins expressed as adult river mouth return forecasts of Lower Columbia River hatchery tule Chinook.

Runsize Forecast Bins	<30,000	30,000 to 40,000	40,000 to 85,000	>85,000
Maximum Exploitation Rate	0.30	0.35	0.38	0.41

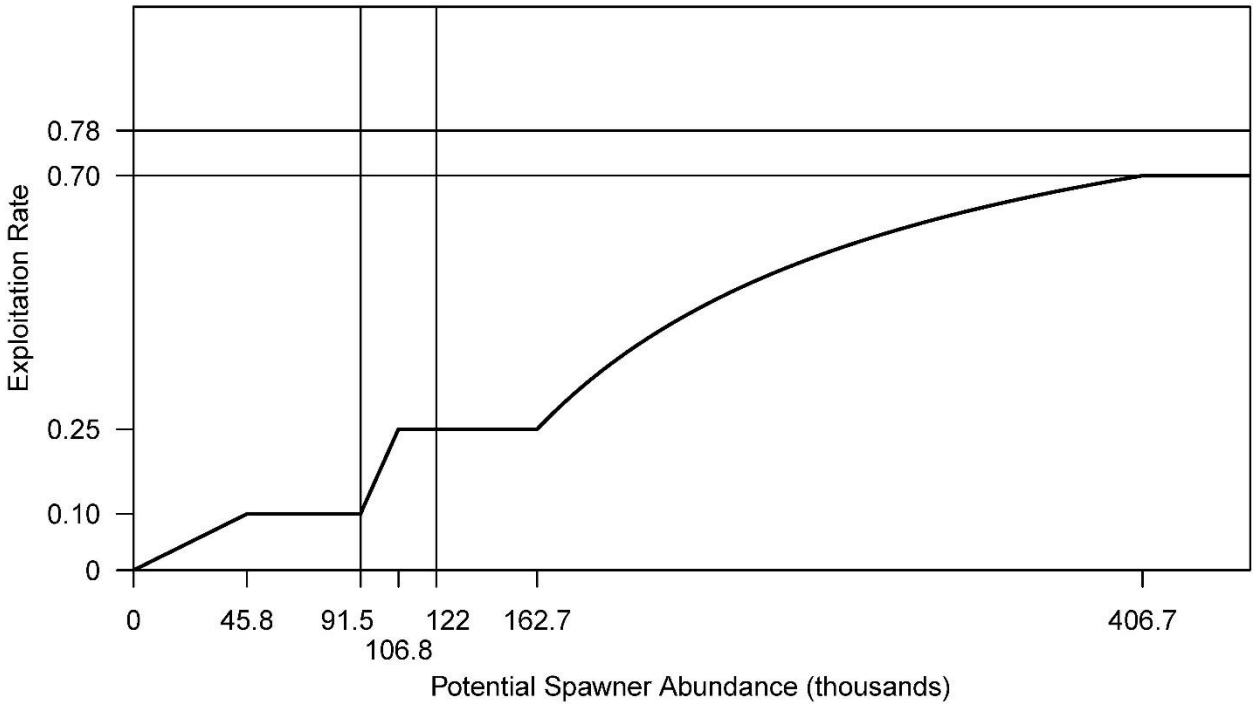

FIGURE A-1. Sacramento River fall Chinook control rule. Potential spawner abundance is the predicted hatchery and natural area adult spawners in the absence of fisheries, which is equivalent to the Sacramento Index. See the salmon FMP, Section 3.3.6, for control rule details.

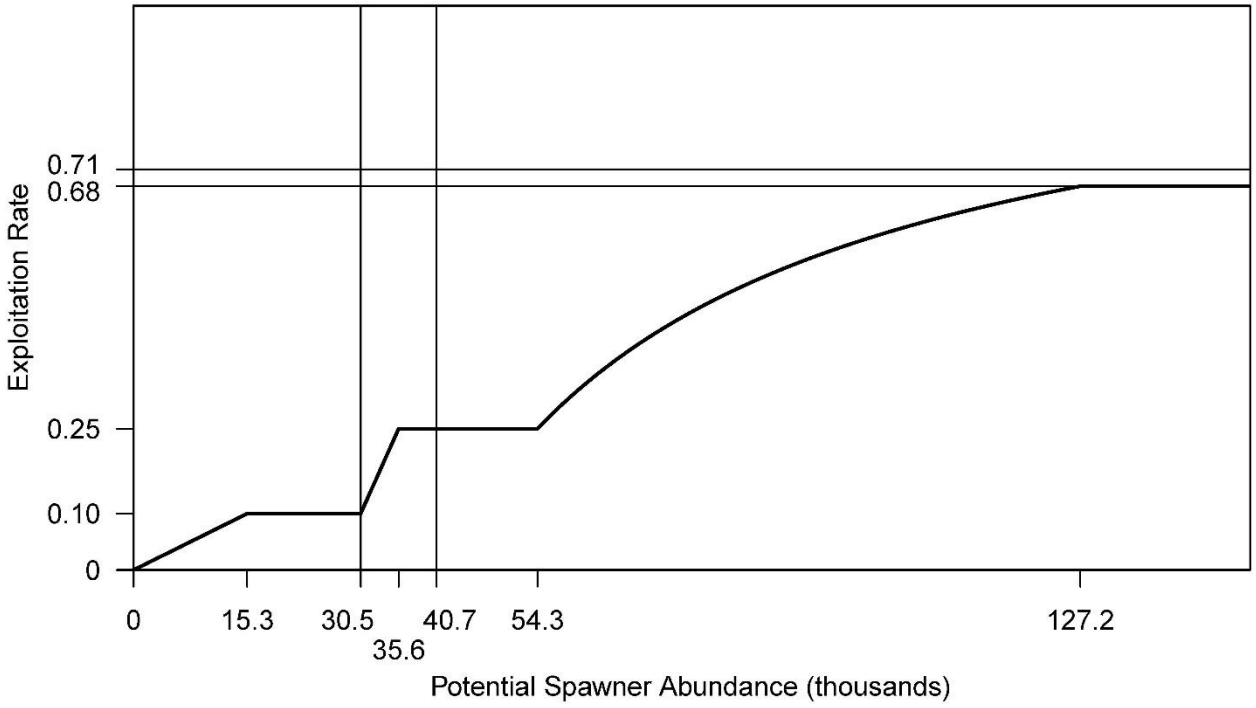

FIGURE A-2. Klamath River fall Chinook control rule. Potential spawner abundance is the predicted natural area adult spawners in the absence of fisheries. See the salmon FMP, Section 3.3.6, for control rule details.

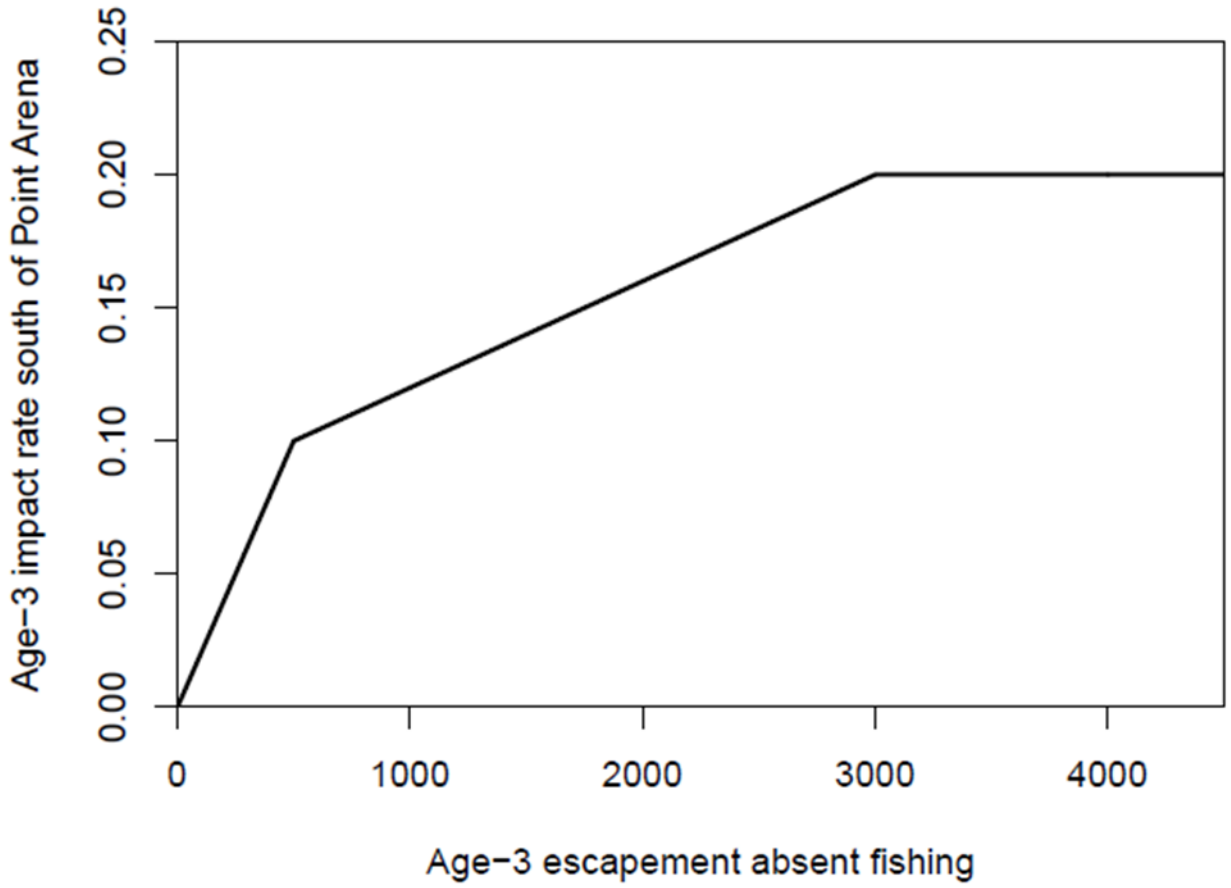

FIGURE A-3. Sacramento River winter Chinook impact rate control rule. The maximum forecast age-3 impact rate for the area south of Point Arena, California, is determined by the forecasted age-3 escapement absent fishing.

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APPENDIX B
SALMON HARVEST ALLOCATION SCHEDULES

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5.3 ALLOCATION

> *"A Conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges."*
>
> *Magnuson-Stevens Act, National Standard 4*

Harvest allocation is required when the number of fish is not adequate to satisfy the perceived needs of the various fishing industry groups and communities, to divide the catch between non-Indian ocean and inside fisheries and among ocean fisheries, and to provide federally recognized treaty Indian fishing opportunity. In allocating the resource between ocean and inside fisheries, the Council considers both in-river harvest and spawner escapement needs. The magnitude of in-river harvest is determined by the states in a variety of ways, depending upon the management area. Some levels of in-river harvests are designed to accommodate federally recognized in-river Indian fishing rights, while others are established to allow for non-Indian harvests of historical magnitudes. Several fora exist to assist this process on an annual basis. The North of Cape Falcon Forum, a state and tribal sponsored forum, convenes the pertinent parties during the Council's preseason process to determine allocation and conservation recommendations for fisheries north of Cape Falcon. The individual states also convene fishery industry meetings to coordinate their input to the Council.

5.3.1 Commercial (Non-Tribal) and Recreational Fisheries North of Cape Falcon

5.3.1.1 Goal, Objectives, and Priorities

Harvest allocations will be made from a total allowable ocean harvest, which is maximized to the largest extent possible but still consistent with PST and treaty-Indian obligations, state fishery needs, and spawning escapement requirements, including consultation standards for stocks listed under the ESA. The Council shall make every effort to establish seasons and gear requirements that 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.

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 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 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.

5.3.1.2 Allocation Schedule Between Gear Types

Initial commercial and recreational allocation will be determined by the schedule of percentages of total allowable harvest as follows:

TABLE 5-1. Initial commercial/recreational harvest allocation schedule 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 average, allow for meeting the specific fishery allocation priorities described above. 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 provided below and as described in Section 6.5.3.2 for certain selective fisheries.

1. Preseason species trades (Chinook and coho) that vary from the allocation schedule may be made by the Council based upon the recommendation of the pertinent recreational and commercial 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 that best meets FMP management objectives.

2. Inseason transfers, including species trades of Chinook and coho, may be permitted in either direction between recreational and commercial fishery allocations 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 registration fisheries. Implementation of inseason transfers will require (1) consultation with the pertinent recreational and commercial SAS members and the STT, and (2) a clear establishment of available fish and impacts from the transfer.

3. An exchange ratio of four coho to one 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 four coho to one Chinook approximately equalizes the species trade in terms of average ex-vessel 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 percent 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 percent will be based on a conservation need to protect weak stocks and will provide larger overall harvest for the entire fishery north of Cape Falcon than would have been possible without the deviation. In addition, the actual harvest of coho may deviate from the initial allocation as provided in Section 6.5.3.2 for certain selective fisheries.

6. The recreational TACs of Chinook and coho derived during the preseason allocation process will be distributed among four major recreational port areas as described for coho and Chinook distribution in Section 5.3.1.3. The Council may deviate from subarea quotas (1) to meet recreational season objectives based on agreement of representatives of the affected ports and/or (2) in accordance with Section 6.5.3.2 with regard to certain selective fisheries. 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.

5.3.1.3 Recreational Subarea Allocations

Coho

The north of Cape Falcon preseason recreational TAC of coho will be distributed to provide 50 percent to the area north of Leadbetter Point and 50 percent to the area south of Leadbetter Point. The distribution of the allocation north of Leadbetter point will vary, depending on the existence and magnitude of an inside fishery in Area 4B, which is served by Neah Bay.

In years with no Area 4B fishery, the distribution of coho north of Leadbetter Point (50 percent of the total recreational TAC) will be divided to provide 74 percent to the area between Leadbetter Point and the Queets River (Westport), 5.2 percent to the area between Queets River and Cape Flattery (La Push), and 20.8 percent to the area north of the Queets River (Neah Bay). In years when there is an Area 4B (Neah Bay) fishery under state management, the allocation percentages north of Leadbetter Point will be modified to maintain more equitable fishing opportunity among the ports by decreasing the ocean harvest share for

Neah Bay. This will be accomplished by adding 25 percent of the numerical value of the Area 4B fishery to the recreational TAC north of Leadbetter Point prior to calculating the shares for Westport and La Push. The increase to Westport and La Push will be subtracted from the Neah Bay ocean share to maintain the same total harvest allocation north of Leadbetter Point. Table 5-2 displays the resulting percentage allocation of the total recreational coho catch north of Cape Falcon among the four recreational port areas (each port area allocation will be rounded to the nearest hundred fish, with the largest quotas rounded downward if necessary to sum to the TAC).

TABLE 5-2. Percentage allocation of total allowable coho harvest among the four recreational port areas north of Cape Falcon.[a/]

Port Area	Without Area 4B Add-on	With Area 4B Add-on	
Columbia River	50.0%	50.0%	
Westport	37.0%	37.0%	plus 17.3% of the Area 4B add-on
La Push	2.6%	2.6%	plus 1.2% of the Area 4B add-on
Neah Bay	10.4%	10.4%	minus 18.5% of the Area 4B add-on

a/ The Council may deviate from these percentages as described under #6 in Section 5.3.1.2.

TABLE 5-3. Example distributions of the recreational coho TAC north of Leadbetter Point.

Sport TAC North of Cape Falcon	Without Area 4B Add-On				With Area 4B Add-On [a/]					
	Columbia River	Westport	La Push	Neah Bay	Columbia River	Westport	La Push	Neah Bay Ocean	Neah Bay Add-on	Neah Bay Total
50,000	25,000	18,500	1,300	5,200	25,000	19,900	1,400	3,700	8,000	11,700
150,000	75,000	55,500	3,900	15,600	75,000	57,600	4,000	13,600	12,000	25,600
300,000	150,000	111,000	7,800	31,200	150,000	114,500	8,000	27,500	20,000	47,500

a/ The add-on levels are merely examples. The actual numbers in any year would depend on the particular mix of stock abundances and season determinations.

Chinook

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 sector.

Inseason management actions may be taken by the NMFS NW Regional Administrator to assure that the primary objective of the Chinook harvest guidelines for each of the four recreational subareas north of Cape Falcon are met. Such actions might include: closure from 0 to 3, or 0 to 6, or 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 species that may be landed; or other actions as prescribed in the annual regulations.

5.3.2 Commercial and Recreational Fisheries South of Cape Falcon

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

when possible, 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 5-4.

(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.)

TABLE 5-4. 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.
Note: The allocation schedule provides guidance only when coho abundance permits a directed coho harvest, not when the allowable impacts are insufficient to allow general coho retention south of Cape Falcon. At such low levels, allocation of the allowable impacts will be determined in the Council's preseason process. Deviations from the allocation may also be allowed to meet consultation standards for ESA-listed stocks (e.g., the 1998 biological opinion for California coastal coho requires no retention of coho in fisheries off California).
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 (unless superseded by requirements to meet a consultation standard for ESA-listed stocks); see text of FMP as modified by Amendment 11 allocation provisions.

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 considerable 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

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 percent

    b. South of Humbug Mountain - 30 percent

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.

5.3.3 Tribal Indian Fisheries

5.3.3.1 California

On October 4, 1993 the Solicitor, Department of Interior, issued a legal opinion in which he concluded that the Yurok and Hoopa Valley Indian tribes of the Klamath River Basin have a federally protected right to the fishery resource of their reservations sufficient to support a moderate standard of living or 50 percent of the total available harvest of Klamath-Trinity basin salmon, whichever is less. The Secretary of Commerce recognized the tribes' federally reserved fishing right as applicable law for the purposes of the MSA (58 FR 68063, December 23, 1993). The Ninth Circuit Court of Appeals upheld the conclusion that the Hoopa Valley and Yurok tribes have a federally reserved right to harvest fish in Parravano v. Babbitt and Brown, 70 F.3d 539 (1995) (Cert. denied in Parravano v. Babbitt and Brown 110, S.Ct 2546 [1996]). The Council must recognize the tribal allocation in setting its projected escapement level for the Klamath River.

5.3.3.2 Columbia River

Pursuant to a September 1, 1983 Order of the U.S. District Court, the allocation of harvest in the Columbia River was established under the "Columbia River Fish Management Plan" which was implemented in 1988 by the parties of U.S. v. Oregon. This plan replaced the original 1977 plan (pages 16-20 of the 1978 FMP). Since the Columbia River Fishery Management Plan expired on December 31, 1998, fall Chinook in Columbia River fisheries were managed through 2007 under the guidance of annual management agreements among the U.S. v. Oregon parties. Since 2008, two 10-year management agreements (2008-2017 and 2018-2027) were negotiated through the U.S. v. Oregon process. The management agreement provides a framework within which the relevant parties may exercise their sovereign powers in a coordinated and systematic manner in order to protect, rebuild, and enhance upper Columbia River fish runs while providing harvest for both treaty Indian and non-Indian fisheries. The parties to the agreement are the United States, the states of Oregon, Washington, and Idaho, and four Columbia River treaty Indian tribes-Warm Springs, Yakama, Nez Perce, and Umatilla.

5.3.3.3 U.S. v. Washington Area

Treaty Indian tribes have a legal entitlement to the opportunity to take up to 50 percent of the harvestable surplus of stocks which pass through their usual and accustomed fishing areas. The treaty Indian troll harvest which would occur if the tribes chose to take their total 50 percent share of the weakest stock in the ocean, is computed with the current version of the Fishery Regulation Assessment Model (FRAM), assuming this level of harvest did not create conservation or allocation problems on other stocks. A quota may be established in accordance with the objectives of the relevant treaty tribes concerning allocation of the treaty Indian share to ocean and inside fisheries. The total quota does not represent a guaranteed ocean harvest, but a maximum allowable catch.

The requirement for the opportunity to take up to 50 percent of the harvestable surplus determines the treaty shares available to the inside/outside Indian and all-citizen fisheries. Ocean coho harvest ceilings off the

Washington coast for treaty Indians and all-citizen fisheries are independent within the constraints that (1) where feasible, conservation needs of all stocks must be met; (2) neither group precludes the other from the opportunity to harvest its share, and; (3) allocation schemes may be established to specify outside/inside sharing for various stocks.

6.5 SEASONS AND QUOTAS

For each management area or subarea, the Council has the option of managing the commercial and recreational fisheries for either coho or Chinook using the following methods: (1) fixed quotas and seasons; (2) adjustable quotas and seasons; and (3) seasons only. The Council may also use harvest guidelines within quotas or seasons to trigger inseason management actions established in the preseason regulatory process.

Quotas provide very precise management targets and work best when accurate estimates of stock abundance and distribution are available, or when needed to ensure protection of depressed stocks from potential overfishing. The Council does not view quotas as guaranteed harvests, but rather the maximum allowable harvest, which assures meeting the conservation objective of the species or stock of concern. While time and area restrictions are not as precise as quotas, they allow flexibility for effort and harvest to vary in response to abundance and distribution.

6.5.1 Preferred Course of Action

Because of the need to use both seasons and quotas, depending on the circumstances, the Council will make the decision regarding seasons and quotas annually during the preseason regulatory process, subject to the limits specified below. Fishing seasons and quotas also may be modified during the season as provided under Section 10.2.

6.5.2 Procedures for Calculating Seasons

Seasons will be calculated using the total allowable ocean harvest determined by procedures described in Chapter 5, and further allocated to the commercial and recreational fishery in accordance with the allocation plan presented in Section 5.3, and after consideration of the estimated amount of effort required to catch the available fish, based on past seasons.

Recreational seasons will be established with the goal of encompassing Memorial Day and/or Labor Day weekends in the season, if feasible. Opening dates will be adjusted to provide reasonable assurance that the recreational fishery is continuous, minimizing the possibility of an in-season closure.

Criteria used to establish commercial seasons, in addition to the estimated allowable ocean harvests, the allocation plan, and the expected effort during the season, will be: (1) bycatch mortality; (2) size, poundage, and value of fish caught; (3) effort shifts between fishing areas; (4) harvest of pink salmon in odd-numbered years; and (5) protection for weak stocks when they frequent the fishing areas at various times of the year.

6.5.3 Species-Specific and Other Selective Fisheries

6.5.3.1 Guidelines

In addition to the all-species and single or limited species seasons established for the commercial and recreational fisheries, other species-limited fisheries, such as "ratio" fisheries and fisheries selective for marked or hatchery fish, may be adopted by the Council during the preseason regulatory process. In adopting such fisheries, the Council will consider the following guidelines:

1. Harvestable fish of the target species are available.
2. Harvest impacts on incidental species will not exceed allowable levels determined in the management plan.

3. Proven, documented, selective gear exists (if not, only an experimental fishery should be considered).
4. Significant wastage of incidental species will not occur or a written economic analysis demonstrates the landed value of the target species exceeds the potential landed value of the wasted species.
5. The selective fishery will occur in an acceptable time and area where wastage can be minimized and target stocks are maximally available.
6. Implementation of selective fisheries for marked or hatchery fish must be in accordance with U.S. v. Washington stipulation and order concerning co-management and mass marking (Case No. 9213, Subproceeding No. 96-3) and any subsequent stipulations or orders of the U.S. District Court, and consistent with international objectives under the PST (e.g., to ensure the integrity of the coded-wire tag program).

6.5.3.2 Selective Fisheries Which May Change Allocation Percentages North of Cape Falcon

As a tool to increase management flexibility to respond to changing harvest opportunities, the Council may implement deviations from the specified port area allocations and/or gear allocations to increase harvest opportunity through mark-selective fisheries. The benefits of any mark-selective fishery will vary from year to year and fishery to fishery depending on stock abundance, the mix of marked and unmarked fish, projected hook-and-release mortality rates, and public acceptance. These factors should be considered on an annual and case-by-case basis when utilizing mark-selective fisheries. The deviations for mark-selective fisheries are subordinate to the allocation priorities in Section 5.3.1.1 and may be allowed under the following management constraints:

1. Mark-Selective fisheries will first be considered during the months of May and/or June for Chinook and July through September for coho. However, the Council may consider mark-selective fisheries at other times, depending on year to year circumstances identified in the preceding paragraph.
2. The total impacts within each port area or gear group on the critical natural stocks of management concern are not greater than those under the original allocation without the mark-selective fisheries.
3. Other allocation objectives (i.e., treaty Indian, or ocean and inside allocations) are satisfied during negotiations in the North of Cape Falcon Forum.
4. The mark-selective fishery is assessed against the guidelines in Section 6.5.3.1.
5. Mark-selective fishery proposals need to be made in a timely manner in order to allow sufficient time for analysis and public comment on the proposal before the Council finalizes its fishery recommendations.

If the Council chooses to deviate from specified port and/or gear allocations, the process for establishing a mark-selective fishery would be as follows:

1. Allocate the TAC among the gear groups and port areas according to the basic FMP allocation process described in Section 5.3.1 without the mark-selective fishery.
2. Each gear group or port area may utilize the critical natural stock impacts allocated to its portion of the TAC to access additional harvestable, marked fish, over and above the harvest share established in step one, within the limits of the management constraints listed in the preceding paragraph.

6.5.4 Procedures for Calculating Quotas

Quotas will be based on the total allowable ocean harvest and the allocation plan as determined by the procedures of Chapter 5.

To the extent adjustable quotas are used, they may be subject to some or all of the following inseason adjustments:

1. For coho, private hatchery contribution to the ocean fisheries in the OPI area.
2. Unanticipated loss of shakers (bycatch mortality of undersized fish or unauthorized fish of another species that have to be returned to the water) during the season. (Adjustment for coho hooking mortality during any all-salmon-except-coho season will be made when the quotas are established.)
3. Any catch that take place in fisheries within territorial waters that are inconsistent with federal regulations in the EEZ.
4. If the ability to update inseason stock abundance is developed in the future, adjustments to total allowable harvest could be made, where appropriate.
5. The ability to redistribute quotas between subareas depending on the performance toward achieving the overall quota in the area.

Changes in the quotas as a result of the inseason adjustment process will be avoided unless the changes are of such magnitude that they can be validated by the STT and Council, given the precision of the original estimates.

The basis for determining the private hatchery contribution in (1) above will be either coded-wire tag analysis or analysis of scale patterns, whichever is determined by the STT to be more accurate, or another more accurate method that may be developed in the future, as determined by the STT and Council.

In reference to (4) and (5) above, if reliable techniques become available for making inseason estimates of stock abundance, and provision is made in any season for its use, a determination of techniques to be applied will be made by the Council through the Salmon Methodology Review process and discussed during the preseason regulatory process.

6.5.5 Procedures for Regulating Ocean Harvests of Pink and Sockeye

Sockeye salmon are only very rarely caught in Council-managed ocean salmon fisheries and no specific procedures have been established to regulate their harvest. Procedures for pink salmon are as follows:

1. All-species seasons will be planned such that harvest of pink salmon can be maximized without exceeding allowable harvests of Chinook and/or coho and within conservation and allocation constraints of the pink stocks.
2. Species specific or ratio fisheries for pink salmon will be considered under the guidelines for species specific fisheries presented in Section 6.5.3, and allocation constraints of the pink stocks.

APPENDIX C
OREGON PRODUCTION INDEX DATA

LIST OF TABLES

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TABLE C-1. Millions of coho smolts [a/] released annually into the OPI area by geographic area and rearing agency.

Year or Average	Columbia River						Oregon Coast				
		Washington						Private			
	Oregon	Early	Late	Combined	Federal	Total	ODFW[b/]	Yearlings	Total	California	Total OPI
1960-1965	5.6	-	-	6.1	4.5	16.2	2.0	-	2.0	0.4	18.6
1966-1970	6.0	10.2	4.9	15.1	6.5	27.6	2.9	0.0	2.9	1.3	31.8
1971-1975	6.8	10.7	6.8	17.5	4.5	28.8	3.9	0.0	3.9	1.2	33.9
1976-1980	8.0	7.3	10.1	17.4	4.7	30.1	3.8	1.4	5.2	0.7	36.0
1981-1985	7.1	4.3	14.4	18.7	3.2	29.0	3.9	3.3	7.2	0.7	36.9
1986-1990	7.3	3.1	15.6	18.7	4.1	30.1	5.2	1.9	7.1	1.4	38.6
1991-1995	9.8	3.6	13.9	17.5	3.5	30.8	4.9	-	4.9	0.9	36.6
1996-2000	7.2	4.5	10.9	15.4	4.3	26.9	2.0	-	2.0	0.6	29.4
2001	7.6	4.2	9.7	13.9	3.7	25.2	0.9	-	0.9	0.6	26.7
2002	7.5	3.3	8.6	11.9	4.3	23.7	1.0	-	1.0	0.6	25.3
2003	8.2	3.3	8.7	12.0	3.1	23.3	0.8	-	0.8	0.5	24.6
2004	6.7	3.0	8.8	11.8	3.6	22.1	0.8	-	0.8	0.6	23.5
2005	6.1	2.5	9.1	11.6	2.8	20.6	0.8	-	0.8	0.6	22.0
2006	6.1	2.8	9.0	11.7	2.6	20.4	0.8	-	0.8	0.6	21.8
2007	6.2	3.1	9.0	12.1	3.1	21.4	0.7	-	0.7	0.6	22.6
2008	6.9	2.8	9.2	12.0	2.9	21.9	0.4	-	0.4	0.5	22.8
2009	6.9	2.5	8.3	10.8	3.2	20.9	0.4	-	0.4	0.6	21.8
2010	5.9	2.0	7.5	9.5	3.1	18.6	0.3	-	0.3	0.5	19.4
2011	5.8	1.8	8.4	10.2	3.0	19.0	0.4	-	0.4	0.5	19.8
2012	5.9	2.2	7.4	9.7	2.7	18.2	0.4	-	0.4	0.6	19.3
2013	6.0	2.0	7.8	9.8	2.9	18.6	0.4	-	0.4	0.6	19.5
2014	6.5	1.5	7.4	8.9	3.0	18.4	0.4	-	0.4	0.6	19.4
2015	5.7	2.1	7.4	9.5	3.0	18.2	0.3	-	0.3	0.4	18.9
2016	5.7	2.2	6.9	9.1	3.0	17.7	0.3	-	0.3	0.3	18.3
2017	5.5	1.7	7.6	9.2	1.9	16.7	0.3	-	0.3	0.3	17.2
2018[c/]	6.1	2.1	7.3	9.4	3.6	19.2	0.3	-	0.3	0.3	19.8

a/ Defined here as 30 fish per pound or larger and released in February or later.

b/ Beginning in 1989, does not include minor releases from STEP projects.

c/ Preliminary.

TABLE C-2. Data set used in predicting Oregon production index hatchery (OPIH) adult coho. Adults and jacks shown in thousands of fish and smolts in millions of fish.

Year (t) or Average	Adults (t)		Jacks (t-1)			Columbia River Smolts (t-1)			
	OPIH[a/]	MSM[b/]	Total OPI[c/]	Columbia River[d/]	OR Coast/ CA[e/]	Total OPI[f/]	Normal Timed[g/]	Delayed[h/]	Delayed Smolt Adjustment[i/]
1970-1975	2,432.6	-	119.0	113.3	5.7	32.7	26.4	1.3	4.7
1976-1980	1,879.5	-	91.7	81.5	10.2	34.9	27.4	2.8	6.4
1981-1985[j/]	867.9	-	47.2	40.6	6.6	33.5	22.6	6.3	8.3
1986-1990	1,486.2	1,459.0	60.6	50.6	10.0	35.9	21.0	8.9	15.5
1991-1995	605.9	581.2	27.7	22.6	5.0	38.1	26.3	5.5	4.5
1996-2000	320.2	329.2	22.4	18.3	4.0	28.9	22.3	3.4	2.5
2001	1,417.1	1,478.7	87.4	71.7	15.7	32.2	28.7	2.0	4.7
2002	649.8	689.5	25.2	18.9	6.3	26.8	23.9	1.4	1.0
2003	936.6	1,009.9	49.9	41.7	8.2	25.3	23.4	0.3	0.5
2004	622.1	693.6	35.4	29.4	6.0	24.5	21.2	2.0	2.5
2005	443.2	454.0	25.0	21.2	3.8	23.4	21.2	0.8	0.8
2006	440.6	523.4	25.9	20.9	5.0	22.0	20.2	0.4	0.4
2007	476.6	545.3	36.3	34.2	2.2	21.8	20.3	0.1	0.2
2008	565.3	576.9	16.0	14.9	1.2	22.7	20.8	0.6	0.4
2009	1,066.2	1,051.0	60.4	58.4	2.0	22.8	20.8	1.1	2.9
2010	551.3	546.5	25.1	23.8	1.4	21.9	20.7	0.2	0.2
2011	442.3	454.2	23.3	22.2	1.1	19.3	18.2	0.3	0.4
2012	182.3	183.1	17.9	13.9	4.0	19.9	18.1	0.9	0.7
2013	316.9	335.1	26.3	24.1	2.2	19.2	17.1	1.1	1.5
2014	1,263.6	1,316.5	51.4	49.4	2.0	19.6	18.0	0.6	1.6
2015	251.7	254.7	39.6	37.0	2.6	19.4	16.9	1.5	3.0
2016	233.8	242.3	19.7	18.6	1.0	18.9	16.9	1.3	1.3
2017	284.8	284.8	22.9	22.4	0.4	18.4	16.5	1.3	1.6
2018	149.4	179.1	19.2	18.5	0.7	17.2	16.0	0.7	0.8
2019	-	933.5 [k/]	51.6	50.8	0.8	19.8	18.6	0.5	1.4

a/ Adult OPIH = Harvest impacts plus escapement for public hatchery stocks originating in the Columbia River, Oregon coastal rivers, and the Klamath River, California.

b/ Adult MSM = Harvest impacts plus escapement for public hatchery stocks originating in the Columbia River, Oregon coastal rivers, and the Klamath River. Estimates derived from the MSM and used for prediction beginning in 2008.

c/ Jack OPI = Total Jack CR and Jack OC.

d/ Jack CR = Columbia River jack returns corrected for small adults.

e/ Jack OC = Oregon coastal and California hatchery jack returns corrected for small adults.

f/ Total OPI = Columbia River (Sm D + Sm CR), Oregon coastal and Klamath Basin.

g/ Sm CR = Columbia River smolt releases from the previous year expected to return as adults in the year listed.

h/ Sm D = Columbia River delayed smolt releases from the previous year expected to return as adults in the year listed.

i/ Correction term for delayed smolts released from Col. R. hatcheries (Col. R. Jacks*(Delayed Smolts/Col. R. Smolts)).

j/ Subsequent to 1983 data not used in predictions due to El Niño impacts.

k/ Preseason predicted adults.

TABLE C-3. Estimated coho salmon natural spawner abundance in Oregon coastal basins for each OCN coho management component.

Component and Basin[a/]	2001-2005 Ave.	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
NORTHERN														
Necanicum	2,534	750	431	1,055	3,827	4,445	2,120	902	798	5,727	847	936	529	393
Nehalem	20,159	11,614	14,033	17,205	21,753	32,215	15,322	2,963	4,539	30,577	3,079	7,549	5,486	3,989
Tillamook	6,563	8,774	2,295	4,828	16,251	14,890	19,250	1,686	4,402	20,090	1,345	7,102	2,927	1,976
Nestucca	7,287	1,876	394	1,844	4,252	1,947	7,857	1,751	946	6,369	1,029	2,412	4,495	1,075
Ind. Tribs.	573	1,121	376	639	2,052	1,473	1,341	218	271	4,607	440	699	206	264
TOTAL	37,116	24,135	17,529	25,571	48,135	54,970	45,890	7,520	10,956	67,370	6,740	18,698	13,643	7,697
NORTH CENTRAL														
Salmon	506	513	59	652	753	1,382	3,636	297	1,165	3,680	332	1,054	450	105
Siletz	6,902	5,205	2,197	20,634	24,070	6,283	33,094	4,495	7,660	19,496	2,216	3,015	5,202	4,040
Yaquina	10,571	4,247	3,158	10,913	11,182	8,589	19,074	6,268	3,553	25,582	2,400	3,730	2,491	4,672
Beaver Ck.	3,487	1,950	611	1,218	3,575	2,072	2,389	1,878	2,015	6,564	332	1,709	1,553	494
Alsea	8,344	1,972	2,146	13,320	14,638	9,688	28,337	8,470	9,283	25,855	6,185	7,375	4,377	5,112
Siuslaw	24,138	5,869	3,552	17,491	30,607	25,983	28,082	11,946	14,118	38,896	10,352	9,141	7,129	6,688
Ind. Tribs.	3,279	1,468	547	3,910	1,610	2,548	4,487	492	1,929	1,890	856	464	1,646	972
TOTAL	57,227	21,224	12,270	68,138	86,435	56,545	119,099	33,846	39,723	121,963	22,673	26,488	22,848	22,083
SOUTH CENTRAL														
Umpqua	37,165	18,092	11,783	37,868	57,984	70,019	94,655	20,969	27,016	66,272	14,860	7,494	15,492	21,987
Coos	26,572	11,266	1,329	14,881	26,979	27,658	10,999	9,414	6,884	38,880	3,030	4,624	2,689	7,074
Coquille	15,571	28,577	13,968	8,791	22,286	23,564	55,667	5,911	23,637	41,660	3,357	9,494	4,641	5,201
Floras Ck.	3,568	1,104	340	786	3,203	11,329	9,217	2,502	1,936	1,022	1,585	942	693	278
Sixes R.	157	294	97	43	176	92	334	34	567	410	168	120	69	95
Coastal Lakes	18,205	24,127	8,955	23,608	17,349	38,744	20,281	18,922	13,659	22,010	4,729	8,044	1,302	6,704
Ind. Tribs.	-	-	-	0	188	484	101	48	33	106	0	0	0	10
TOTAL	101,238	83,460	36,472	85,977	128,165	171,890	191,254	57,800	73,732	170,360	27,729	30,718	24,886	41,349
SOUTH														
Rogue[b/]	12,349	3,911	5,136	414	2,566	3,671	4,545	5,474	11,210	2,409	4,072	6,302	4,529	8,266
COASTWIDE	207,930	132,730	71,407	180,100	265,301	287,076	360,788	104,640	135,621	362,102	61,214	82,206	65,906	79,395

a/ The sum of the individual basins may not equal the aggregate totals due to the use of independent estimates at different geographic scales.

b/ Mark recapture estimate based on seining at Huntley Park in the lower Rogue River.

TABLE C-4. Data set used in predicting Oregon coastal natural river (OCNR) coho ocean recruits with random survey sampling and Mixed Stock Model (MSM) accounting. All environmental data in year of ocean entry (t-1) except SST-J, which is January of adult return year (t). Spawners is parent brood (t-3). Recruits shown in thousands of fish.

	Recruits		Environmental Index-Month(s)[a/]							
Year (t)	Adults	Spawners	PDO-MJJ	UWI-JAS	UWI-SON	SSH-AMJ	SST-AMJ	SST-J	MEI-ON	SPR.TRN
1970-1975	237.5	112.3	-0.7	35.5	-19.7	-84.8	11.6	9.0	-0.5	98.3
1976-1980	204.3	30.7	-0.3	26.4	-29.2	-113.6	11.1	9.9	0.1	86.0
1981-1985	148.9	26.8	-0.1	28.4	-30.0	-96.8	11.4	10.4	0.5	85.0
1986-1990	153.8	28.9	0.1	29.6	-39.2	-91.0	11.6	10.4	0.4	82.0
1991-1995	150.7	27.0	0.3	29.3	-40.8	-77.9	11.6	10.4	0.7	89.0
1996-2000	131.8	25.2	0.5	31.2	-49.0	-61.7	11.7	10.8	0.6	94.8
2000	156.6	21.5	0.4	35.8	-26.8	-56.2	11.4	10.2	-0.6	72.0
2001	246.1	34.7	-0.4	47.1	-38.2	-126.2	10.7	10.1	-0.2	61.0
2002	227.3	61.0	-0.6	50.5	-25.9	-148.6	10.1	11.0	1.0	80.0
2003	164.0	143.1	-0.2	55.5	-26.4	-63.5	11.1	10.3	0.5	112.0
2004	146.3	236.4	0.0	27.0	4.3	-62.6	11.9	10.2	0.7	110.0
2005	113.3	213.3	0.5	51.8	-9.0	-25.7	12.5	11.5	-0.3	145.0
2006	64.9	154.1	0.8	53.6	-14.1	-36.4	11.2	9.8	1.1	112.0
2007	157.0	139.9	0.6	27.5	-9.9	-123.7	10.6	8.9	-1.2	74.0
2008	262.9	104.7	0.2	32.7	-10.7	-113.3	9.6	9.4	-0.6	89.0
2009	255.6	57.3	-0.3	24.3	-47.1	-96.0	10.5	10.8	1.0	82.0
2010	352.4	156.1	-0.5	34.2	-32.9	-48.5	11.7	10.1	-1.7	100.0
2011	98.1	245.4	-0.8	29.3	-26.3	-46.3	10.7	9.2	-0.9	100.0
2012	130.2	244.7	-0.7	53.6	-29.9	-34.5	11.0	9.9	0.1	121.0
2013	377.4	336.0	-0.8	35.3	-7.8	-106.6	10.7	9.1	0.0	100.0
2014	64.6	80.2	-0.4	41.3	-40.1	-30.1	11.2	12.3	0.6	101.0
2015	74.3	110.8	0.2	40.4	-7.9	-65.4	10.3	11.0	2.3	92.0
2017	67.4	337.7	1.0	48.0	-68.2	-127.4	11.6	9.9	-0.3	85.0
2018	73.6	52.4	1.3	46.1	-36.2	-63.9	11.2	11.0	-0.4	116.0
2019[b/]	70.1	67.9	1.0	41.1	-12.4	-116.2	10.8	11.1	0.6	107.0

a/ Environmental Index descriptions:

PDO - Pacific Decadal Oscillation (4-year moving average)

UWI - Upwelling wind index (mean upwelling winds index in months of ocean migration year at 42º N 125º W)

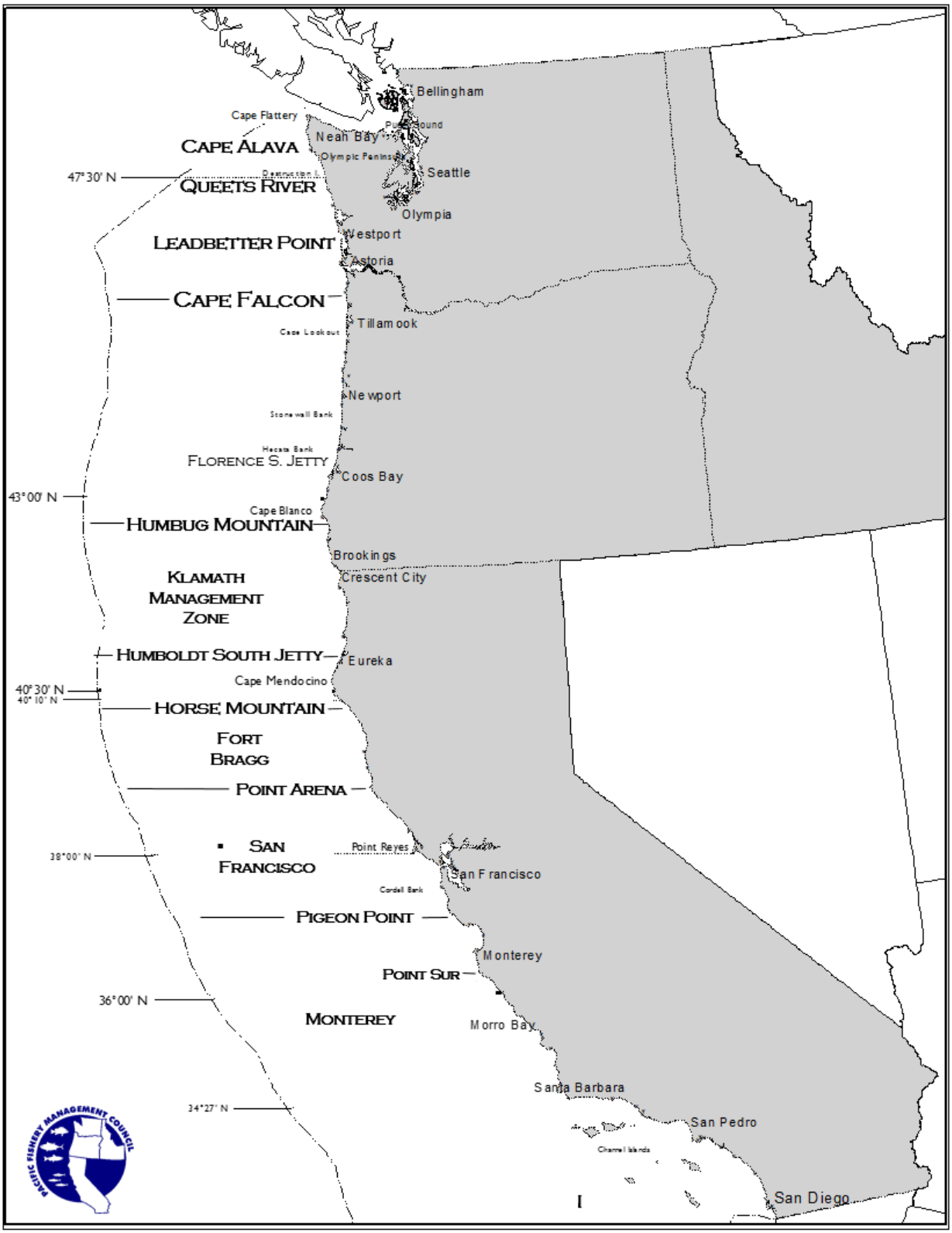
SSH - Sea surface height (South Beach, OR at 44º 37.5´ N, 124 º 02.6´ W)

SST - Sea surface temperature (mean sea surface temperature in January of return year at Charleston, OR)

MEI - Multi-variate ENSO index

SPR.TRN - Spring transition date (Julian)

b/ Adult recruits is a forecasted number.



This map is for reference only and is not intended for use in navigation or fishery regulation.