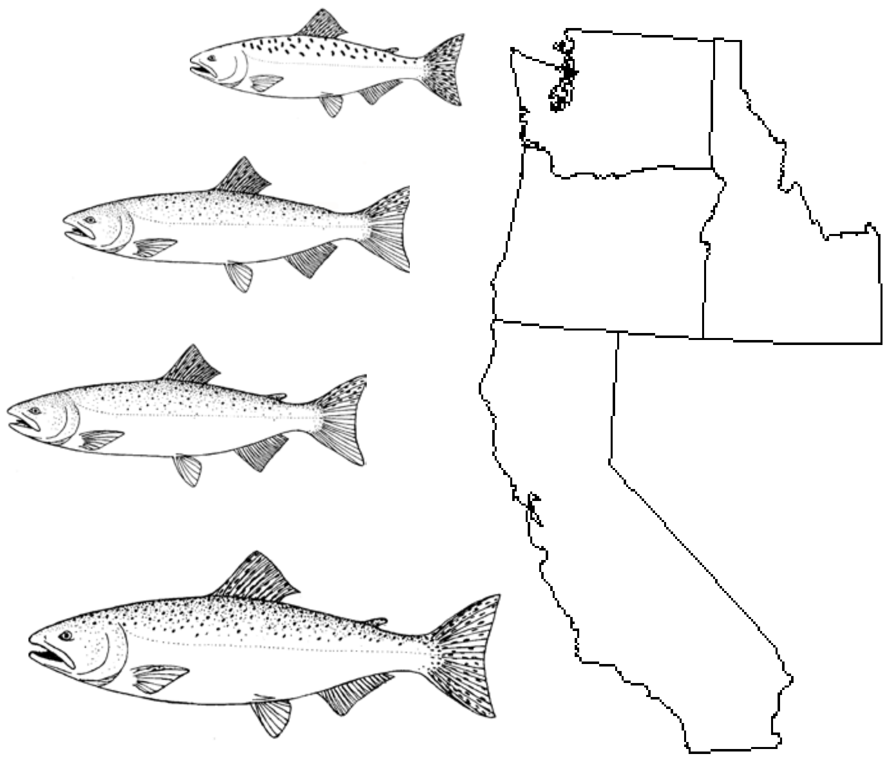
PRESEASON REPORT I

STOCK ABUNDANCE ANALYSIS

AND

ENVIRONMENTAL ASSESSMENT PART 1 FOR 2016 OCEAN SALMON FISHERY REGULATIONS

REGULATION IDENTIFIER NUMBER 0648-BF56



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Corrections were made on March 1, 2016 to Table V-4 and Table V-6

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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}	MSY 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 brights (bright hatchery fall Chinook released below McNary Dam)
MFMT	maximum fishery mortality threshold
MOC	mid-Oregon coast
MSST	minimum stock size threshold
MSM	mixed stock model
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSY	maximum sustainable yield
NA	not available

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOC	north Oregon coast
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
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 Spring Creek Hatchery)
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	upper river brights (naturally spawning bright fall Chinook normally 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 salmon fishery 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 2016 meeting.

This report provides 2016 salmon stock abundance forecasts, and an analysis of the impacts of 2015 management measures, or regulatory procedures, on the projected 2016 abundance. This analysis is intended to give perspective in developing 2016 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 2016 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 2016 ocean salmon fisheries, a description of the alternatives, and an analysis of the environmental consequences of the alternatives. Preseason Report II will 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 2015 regulations applied to 2016 abundance forecasts. Three 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. 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 Need

The purpose of this action, implementation of the 2016 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, 2015 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 2016 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 2016 fisheries.

STT Concerns

Ocean Conditions and Preseason Stock Abundance Forecasts

The abundance of most coho stocks, as well as southern fall Chinook stocks (Sacramento and Klamath), came in well below preseason forecasts in 2015. This pattern of over-predicting abundance for many stocks also occurred during the strong El Niño events of 1982-1983 and 1997-1998. We are currently experiencing another very strong El Niño that in some ways is comparable to those well-described events. Sea surface temperature anomalies indicate exceptionally warm conditions over much of the northeast Pacific over the past two years. In their State of the California Current report for 2016, the California Current Ecosystem Assessment team described several phenomena that can be viewed as unfavorable to salmon. These include low biomass of northern copepods, low biomass of forage fishes such as sardines and anchovies, and recent large-scale mortality events for common murres, California sea lions, and other marine mammals. While local scale ocean conditions may affect individual salmon stocks differently, these large scale indicators suggest relatively unproductive conditions in the California Current. Given the incidence of over-forecasting abundance for many stocks in 2015, and the apparent continuation of unproductive ocean conditions, the STT is concerned that abundance forecasts presented in this report may prove to be optimistic.

Sacramento River Winter Chinook Allowable Impact Rate

There are several indicators suggesting that the 2014 and 2015 broods of Sacramento River winter Chinook (SRWC) have very low abundance. Largely due to drought conditions, the estimated egg-to-fry survival rates for the natural-origin component of these broods were the two lowest ever observed. A strong El Niño is currently underway, sea surface temperatures have been anomalously warm off the central California coast since the spring of 2014, and the coastal ocean has been relatively unproductive. The 2014 and 2015 broods will be contacted by 2016 ocean salmon fisheries, with the 2014 brood recruited to the fishery as age-3 fish. Fishery management for SRWC is currently guided by a control rule that specifies a maximum allowable age-3 impact rate as a function of the geometric mean of the previous three years of escapement. Because of the retrospective nature of the control rule, the STT is concerned it will not be responsive to the apparent rapid and substantial decline in SRWC abundance.

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CHAPTER I: DESCRIPTION OF THE AFFECTED ENVIRONMENT

The affected environment relevant to establishing the 2016 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 2015 Ocean Salmon Fisheries (PFMC 2016). The current status (2016 ocean abundance forecasts) of the environmental components expected to be affected by the 2016 ocean salmon fisheries regulation alternatives (FMP salmon stocks, including those listed under the ESA) are described in this report (Part 1 of the 2016 salmon EA); the Review of 2015 Ocean Salmon Fisheries (PFMC 2016) 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 2015 NEPA process for ocean salmon regulations (Preseason Reports II and III; PFMC 2015b and 2015c). 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, 2015a)
- Marine mammals – pinnipeds, killer whales (NMFS 2003, 2008; PFMC 2006, 2015a)
- Seabirds (NMFS 2003; PFMC 2006, 2015a)
- Ocean and coastal habitats, ESA critical habitat, and Essential Fish Habitat (EFH) (NMFS 2003; PFMC 2006, 2015a)
- Biodiversity and ecosystem function (NMFS 2003; PFMC 2006, 2015a)
- Unique characteristics of the geographic area (NMFS 2003; PFMC 2006, 2015a)
- Cultural, scientific, or historical resources such as those eligible for listing in the National Register of Historic Places (NMFS 2003; PFMC 2006, 2015a)
- Public health or safety (NMFS 2003; PFMC 2006, 2015a)

The 2016 No-Action alternative is not expected to differ from the 2015 action in any way that would change the effects of the action on these elements of the environment.

The component of the affected environment that is analyzed in this document consists only of the salmon stocks identified in the FMP (Appendix A). The 2016 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 2016 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 2016 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-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 2016 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): Sacramento River Winter, Central Valley Spring, California Coastal, Lower Columbia River (LCR) natural tule, and Snake River Fall Chinook; and Central California and Southern Oregon/Northern California coho, as well as Interior Fraser (including Thompson River) coho.

ACCEPTABLE BIOLOGICAL CATCH, ANNUAL CATCH LIMITS, AND OVERFISHING LIMITS

Amendment 16 to the Salmon FMP was approved in December 2011 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. Since publication of Amendment 16, ABCs and ACL specifications have been added to the Salmon FMP for Willapa Bay natural coho. Other stocks in the FMP were not required to have ACLs either because they were components of these two stock complexes, or they were ESA-listed, hatchery stocks, or managed under an international agreement.

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 provide 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 Fishery Mortality Threshold, MFMT) and sufficient information available to make abundance forecasts.

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

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

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}.

STATUS DETERMINATION CRITERIA

In 2011, the Council also adopted new status determination criteria (SDC) for overfishing, approaching an overfished condition, overfished, not overfished/rebuilding, and rebuilt under FMP Amendment 16. These criteria, approved and implemented in December 2011, were:

- 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}.

Status determinations for overfishing, overfished, not overfished/rebuilding, and rebuilt were reported in the annual SAFE document, Review of 2015 Ocean Salmon Fisheries (PFMC 2016). Because approaching an overfished condition relies on a preseason forecast and proposed fishing regulations, that status determination is reported in Chapter V of this document. 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 determinations 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	2008	2009	2010	2011	2012	2013	2014	2015	2016	Methodology for 2016 Prediction and Source
Sacramento Index										
Fall	54.6[a/]	122.2	245.5	729.9	819.4	834.2	634.7	652.0	299.6	Log-log regression of the Sacramento Index on jack escapement from the previous year, accounting for lag-1 autocorrelated errors. STT.
Klamath River (Ocean Abundance)										
Fall	190.7	505.7	331.5	371.1	1,651.8	727.7	299.3	423.8	142.2	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 [b/]	269.3	298.9	470.0	198.4	314.2	141.4	227.0	232.5	188.8	Log-normal sibling regressions of cohort returns in previous run years. WDFW staff.
Willamette Spring	34.0	37.6	62.7	104.1	83.4	59.8	58.7	55.4	70.1	Age-specific linear regressions of cohort returns in previous run years. ODFW staff.
Sandy Spring	6.8	5.2	3.7	5.5	4.8	6.1	5.5	5.5	NA	
Cowlitz Spring	5.2	4.1	12.5	6.6	8.7	5.5	7.8	11.2	25.1	Age-specific linear regressions of cohort returns in previous run years. WDFW.
Kalama Spring	3.7	0.9	0.9	0.6	0.7	0.7	0.5	1.9	4.9	Age-specific linear regressions of cohort returns in previous run years. WDFW.
Lewis Spring	3.5	2.2	6.0	3.4	2.7	1.6	1.1	1.1	1.0	Age-specific linear regressions of cohort returns in previous run years. WDFW.
Upriver Summer	52.0	70.7	88.8	91.9	91.2	73.5	67.5	73.0	93.3	Log-linear brood year sibling regressions or average return (4-ocean fish). Columbia River TAC subgroup and WDFW.
URB Fall	162.5	259.9	310.8	398.2	353.5	432.5	973.3	500.3	589.0	Age-specific average cohort ratios or brood year sibling regressions. Columbia River TAC subgroup and WDFW.
SCH Fall	87.2	59.3	169.0	116.4	63.8	38.0	115.1	160.5	89.6	Age-specific average cohort ratios or brood year sibling regressions. Columbia River TAC subgroup and WDFW.
LRW Fall	3.8	8.5	9.7	12.5	16.2	14.2	34.2	18.9	22.2	Age-specific average cohort ratios or brood year sibling regressions. Columbia River TAC subgroup and WDFW.
LRH Fall	59.0	88.8	90.6	133.5	127.0	88.0	110.0	94.9	133.7	Age-specific average cohort ratios or brood year sibling regressions. Columbia River TAC subgroup and WDFW.
MCB Fall	54.0	94.5	72.6	100.0	90.8	105.2	360.1	113.3	101.0	Age-specific average cohort ratios or brood year sibling regressions. Columbia River TAC subgroup and WDFW.

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

Production Source and Stock or Stock Group		2008	2009	2010	2011	2012	2013	2014	2015	2016	Methodology for 2016 Prediction and Source
Willapa Bay Fall	Natural	2.5	2.0	2.0	2.0	5.2	4.9	2.9	3.8	3.3	Return per spawners applied to 3-6 year olds (brood years 2010-13) adjusted by brood year performance.
	Hatchery	27.0	34.8	31.1	31.1	40.5	22.2	29.5	31.0	36.2	Return per spawners applied to 3-6 year olds (brood years 2010-13) adjusted by brood year performance.
Quinault Fall	Natural	3.7	6.9	7.6	5.9	7.7	4.0	6.0	NA	NA	
	Hatchery	1.3	7.8	5.5	4.7	3.8	3.1	10.3	NA	NA	
Queets Spring/Sum	Natural	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.4	NA	
Queets Fall	Natural	3.5	4.5	4.1	2.7	5.8	3.8	3.6	4.3	NA	
	Hatchery	7.0	1.2	9.8	1.9	1.8	0.9	0.9	1.5	NA	
Hoh Spring/Summer	Natural	0.9	1.1	0.8	1.0	1.0	0.9	0.9	0.8	0.9	Spawner/Recruit all years geometric mean for each age class
Hoh Fall	Natural	2.9	2.6	3.3	2.9	2.7	3.1	2.5	2.6	1.8	Spawner/Recruit of recent 3 years adjusted by previous brood performance for all ages
Quillayute Spring	Hatchery	1.7	2.0	1.5	1.4	1.5	2.1	2.0	1.7	1.8	Recent 2 year mean adjusted by previous performance.
Quillayute Sum/Fall	Natural	6.0	6.8	7.5	8.8	7.4	6.6	7.6	8.5	7.5	Summer: Recent 5 year mean for all ages except age-3. Used the regression of age-3 to escapement. Fall: Recent 5 year means; adjusted for previous 5 year forecast performance
Hoko[e/]	Natural	1.1	1.0	1.8	0.6	1.9	1.2	2.7	3.3	2.9	2016 Recruits for age-3's 5 year average return, age 3-6 sibling regression
North Coast Totals											
Spring/Summer	Natural	1.3	1.5	1.2	1.4	1.4	1.3	1.4	1.2	NA	
Fall	Natural	16.1	20.8	22.5	20.3	23.6	17.5	19.7	15.4	9.3	
Spring/Summer	Hatchery	1.7	2.0	1.5	1.4	1.5	2.1	2.0	1.7	1.8	
Fall	Hatchery	8.3	9.0	15.3	6.6	5.6	4.0	11.2	1.5	0.0	
Puget Sound summer/fall[c/]											
Nooksack/Samish	Hatchery	35.3	23.0	30.3	37.5	44.0	46.3	43.9	38.6	27.9	Avererage of previous two years
East Sound Bay	Hatchery	0.8	0.1	2.3	0.4	0.4	1.9	1.2	1.2	0.7	Avererage of previous two years
Skagit[d/]	Natural	23.8	23.4	13.0	14.3	8.3	12.9	18.0	11.8	15.1	Hierarchical Bayesian model to estimate the spawner-recruit dynamics.
	Hatchery	0.7	0.6	0.9	1.5	1.3	0.3	0.3	0.6	0.4	Recent 4 year average terminal smolt to adult return rate to estimate age classes 3 – 5

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

Production Source and Stock or Stock Group		2008	2009	2010	2011	2012	2013	2014	2015	2016	Methodology for 2016 Prediction and Source
Stillaguamish[e/]	Natural	1.1	1.7	1.4	1.8	0.9	1.3	1.6	0.5	0.5	Natural plus Hatchery. Multiple regression environmental model (EMPAR).
Snohomish[e/]	Natural	6.5	8.4	9.9	7.4	2.8	3.6	5.3	4.2	3.3	Multiple regression environmental model (EMPAR).
	Hatchery	8.8	4.9	5.6	5.2	3.9	6.9	5.4	3.3	5.0	Average terminal run.
Tulalip[e/]	Hatchery	4.1	4.0	3.4	3.5	5.9	10.9	4.7	1.3	1.4	Multiple regression environmental model (EMPAR).
South Puget Sound	Natural	21.1	17.2	12.7	8.9	8.9	5.0	4.8	3.8	4.5	Puyallup R. average return per spawner applied to brood years contributing ages 3-5. For Nisqually, 3 year average SAR age specific survival. For Green, 3-year average return/out-migrant rate for each age.
	Hatchery	101.3	93.0	97.4	118.6	95.8	102.0	96.7	62.4	43.1	Average return at age multiplied by smolt release for Green, Nisqually, Puyallup, Carr Inlet, and Area 10E.
Hood Canal[d/]	Natural	2.6	2.5	2.4	2.2	2.9	3.4	3.5	3.1	2.3	Natural fish based on the Hood Canal terminal run reconstruction-based relative contribution of the individual Hood Canal management units in the 2013-2015 return years
	Hatchery	34.2	40.1	42.6	38.4	43.9	65.7	80.6	59	42.7	Brood 2012 fingerling lbs released from WDFW facilities in 2013, multiplied by the average of post-season estimated terminal area return rates for the last 3 years (2013-2015).
Strait of Juan de Fuca Including Dungeness spring run [d/]	Natural	3.2	2.4	1.9	2.5	2.9	3.1	3.8	4.9	3.7	Natural and hatchery. Dungeness and Elwha hatchery estimated by recent return rates time average releases. Dungeness wild estimated by smolts times average hatchery return rate. Elwha wild estimated using recent 3 year returns from otolith and CWT.

a/ Does not include the river harvest component. SI forecasts after 2008 include river harvest.

b/ Beginning in 2005, the upriver spring/summer designation was changed, with stream type Snake Basin summer fish being combined with the spring stock.

c/ 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.

d/ Terminal run forecast.

e/ Expected spawning escapement without fishing.

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

Production Source and Stock or Stock Group		2008	2009	2010	2011	2012	2013	2014	2015	2016	Methodology for 2016 Prediction and Source
OPI Area (Total Abundance) (California and Oregon Coasts and Columbia River)		276.1	1,284.7	556.0	624.5	632.7	716.4	1,213.7	1,015.0	549.2	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	216.1	1,073.1	408.0	375.1	341.7	525.4	983.1	808.4	396.5	OPIH: 1969-2014 Columbia River jacks adjusted for delayed smolt releases and total OPI jacks regressed on 1970-2015 adults. Columbia/Coastal proportions based on jacks; Columbia early/late proportions based on jacks; Coastal N/S proportions based on smolts.
Columbia River Early		110.3	672.7	245.3	216.0	229.8	331.6	526.6	515.2	153.7	
Columbia River Late		86.4	369.7	144.2	146.5	87.4	169.5	437.5	261.8	226.9	
Coastal N. of Cape Blanco		1.7	7.3	4.4	3.6	6.4	5.6	4.8	6.9	5.5	
Coastal S. of Cape Blanco		17.7	23.4	14.1	9.0	18.1	18.7	14.2	24.4	10.4	
Lower Columbia River	Natural	13.4	32.7	15.1	22.7	30.1	46.5	33.4	35.9	40.0	Oregon: recent three year cohort average; Washingtion: natural smolt production multiplied by 2013 brood marine survival rate. Abundance is subset of early/late hatchery abundance above.
Oregon Coast (OCN)	Natural	60.0	211.6	148.0	249.4	291.0	191.0	230.6	206.6	152.7	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 return.
Washington Coast											
Willapa	Natural	35.1	33.5	20.4	47.8	81.3	58.6	58.9	42.9	39.5	
	Hatchery	25.5	59.4	78.7	64.7	88.8	37.1	41.0	57.7	28.1	
Grays Harbor	Natural	42.7	59.2	67.9	89.1	150.2	196.8	108.8	142.6	NA	
	Hatchery	53.1	63.5	33.3	44.0	47.8	85.2	65.4	46.6	22.9	A variety of methods were used for 2016, primarily based on smolt production and survival. See text in Chapter III for details.
Quinault	Natural	17.4	16.3	16.7	22.9	27.3	32.1	25.0	44.2	17.1	
	Hatchery	24.5	26.2	26.6	35.5	35.4	42.0	24.7	24.9	19.8	
Queets	Natural	10.2	31.4	21.8	13.3	37.2	24.5	10.3	7.5	3.5	
	Hatchery	10.3	13.5	11.9	16.3	25.3	19.8	15.7	11.3	4.5	
Hoh	Natural	4.3	9.5	7.6	11.6	14.3	8.6	8.9	5.1	2.1	

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

Production Source and Stock or Stock Group		2008	2009	2010	2011	2012	2013	2014	2015	2016	Methodology for 2016 Prediction and Source
Quillayute Fall	Natural	10.5	19.3	22.0	28.2	33.5	17.2	18.4	10.5	4.5	
	Hatchery	13.0	39.5	17.7	31.0	16.9	12.4	12.6	8.0	6.4	
Quillayute Summer	Natural	1.1	2.2	2.8	2.8	5.7	0.5	2.0	1.2	0.3	
	Hatchery	4.2	12.9	3.2	5.4	4.3	3.3	3.2	2.2	1.4	
North Coast Independent Tributaries	Natural	3.2	11.1	4.2	21.6	15.7	17.8	15.2	11.7	1.9	
	Hatchery	5.0	14.1	5.7	11.8	11.4	6.3	11.6	11.9	2.5	
WA Coast Total	Natural	132.7	177.3	165.3	233.3	362.5	361.8	247.5	265.6	68.9	
	Hatchery	135.7	229.1	177.1	208.7	229.9	206.1	174.2	162.6	85.6	
Puget Sound											
Strait of Juan de Fuca	Natural	24.1	20.5	8.5	12.3	12.6	12.6	12.5	11.1	4.4	A variety of methods were used for 2016, 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	9.5	7.0	7.8	15.2	18.6	17.6	17.3	11.1	3.9	
Nooksack-Samish	Natural	14.8	7.0	9.6	29.5	25.2	45.4	20.8	28.1	9.0	
	Hatchery	47.1	25.5	36.0	45.7	62.8	49.2	61.7	50.8	28.8	
Skagit	Natural	61.4	33.4	95.9	138.1	48.3	137.2	112.4	121.4	8.9	
	Hatchery	18.3	11.7	9.5	16.7	14.9	16.3	15.8	19.5	4.9	
Stillaguamish	Natural	31.0	13.4	25.9	66.6	47.5	33.1	32.5	31.3	2.8	
	Hatchery	0.1	0.0	5.4	0.6	4.1	3.1	6.0	0.0	0.0	
Snohomish	Natural	92.0	67.0	99.4	180.0	109.0	163.8	150.0	151.5	20.6	
	Hatchery	53.5	53.6	24.5	55.0	45.7	111.5	78.2	53.9	16.7	
South Sound	Natural	27.3	53.6	25.3	98.9	43.1	36.0	62.8	63.0	9.9	
	Hatchery	170.0	188.8	186.4	173.3	162.9	151.0	150.7	180.2	27.1	
Hood Canal	Natural	30.4	48.6	33.2	74.7	73.4	36.8	82.8	61.5	35.3	
	Hatchery	35.0	52.0	51.2	74.9	62.6	68.6	47.6	108.4	83.5	
Puget Sound Total	Natural	281.0	243.5	297.8	600.1	359.1	464.9	473.8	467.9	91.0	
	Hatchery	333.5	338.6	320.8	381.4	371.6	417.3	377.3	423.9	165.0	

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 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 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 $\log \mathrm{SI}$ for year *t*-1 and the postseason estimate of $\log \mathrm{SI}$ 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 2015, the postseason estimate of the SI was 255,287, which is 39 percent of the preseason forecast of 651,985.

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 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 2015 were expected to result in 341,000 hatchery and natural area spawners and an exploitation rate of 47.7 percent. Postseason estimates of these quantities were 112,434 hatchery and natural area adult spawners and an exploitation rate of 56.0 percent (Table II-1).

Stock Forecast and Status

Sacramento Index forecast model parameters were estimated from SI data for years 1983-2015 and jack escapement data for years 1982-2014. A total of 19,954 SRFC jacks were estimated to have escaped to Sacramento River basin hatcheries and natural spawning areas in 2015. This jack escapement the estimated parameters

$\beta_o = 7.619956,$
$\beta_1 = 0.548526,$
$\rho = 0.7147045\ ,$
$\epsilon_{t-1} = -0.7215839,$
$\sigma^2 = 0.1498808,$

result in a 2016 SI forecast of 299,609.

Figure II-2 graphically displays the 2016 SI forecast. The model fit (line in Figure II-2) was higher than the 2015 postseason estimate of the SI. As a result, the 2016 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 0.59 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 2016.

In 2016, invoking *de minimis* fishing rates under Amendment 16 will be unnecessary because SRFC potential spawner abundance is projected to be greater than 162,667 hatchery and natural area adults. Therefore, projected escapement will meet or exceed the S_{MSY} of 122,000 by an exploitation rate greater than 0.25.

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} = 299,609 × (1-0.78) = 65,914. 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} = 299,609 × (1-0.70) = 89,883, 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.

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 for the area south of Point Arena, California (allowable as a preseason forecast) based on the geometric mean of the most recent three years of spawner escapement (see Appendix A, Figure A-3 for a description of the control rule).

The geometric mean of SRWC escapement for years 2013-2015 is 3,981. Application of the control rule results in a maximum forecast age-3 impact rate of 19.9 percent for 2016 fisheries (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 1979-2011). 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 2.72 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 2.03 times the postseason estimates (Table II-4). The September 1, 2014 age-3 forecast (342,200) was 1.95 times its postseason estimate (175,694). The age-4 forecast (71,100) was 1.08 times its postseason estimate (65,545); and the age-5 forecast (10,400) was 0.79 times its postseason estimate (13,174). The preseason forecast of the adult stock as a whole was 1.67 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.

A control rule, adopted as part of Amendment 16 to the salmon FMP, is 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 regulations adopted in 2015 were expected to result in 40,700 natural-area spawning adults and an age-4 ocean harvest rate of 16.0 percent. Postseason estimates of these quantities were 28,120 natural-area adult spawners and an age-4 ocean harvest rate of 21.3 percent (Table II-5 and Table II-6).

Stock Forecast and Status

The 2016 forecast for the ocean abundance of KRFC as of September 1, 2015 (preseason) is 93,393 age-3 fish, 45,105 age-4 fish, and 3,671 age-5 fish.

Late-season ocean fisheries in 2015 (September through November) were estimated to have harvested 176 adult KRFC, including 24 age-4 (a 0.05 percent age-4 ocean harvest rate), which will be deducted from the ocean fishery's allocation in determining the 2016 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 2016 KRFC potential spawner abundance forecast is 41,211 natural-area adults. This potential spawner abundance forecast applied to the KRFC control rule results in an allowable exploitation rate of 0.25, which produces, in expectation 30,909 natural-area adult spawners. Therefore, fisheries impacting KRFC must be crafted to achieve, in expectation, a minimum of 30,909 natural-area adult spawners in 2016.

In 2016, invoking *de minimis* fishing rates under Amendment 16 will be necessary because KRFC potential spawner abundance is projected to be less than 54,267 natural-area adults.

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 $S_{OFL} = 41{,}211 \times (1\text{-}0.71) = 11{,}951$. 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 $S_{ABC} = 41{,}211 \times (1\text{-}0.68) = 13{,}188$, 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 2015, the age-4 ocean harvest rate was estimated to be 21.3 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 2016, 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 2015 NOC density from standard survey areas (Nehalem R. through the Siuslaw R.) was a 25 percent increase from 2014 (PFMC 2016, Appendix B, Table B-11).

Based on the density index of total spawners, the generalized expectation for NOC stocks in 2016 is above recent years' average abundance. Specifically, the 2015 spawner density in standard survey areas for the NOC averaged 194 spawners per mile, the highest since 2004.

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. Age-specific ocean abundance forecasts for 2016 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 2015 MOC density from standard survey areas (Coos and Coquille basins) averaged 186 adult spawners per mile, above recent years' average abundance and the second highest since 2003 (PFMC 2016, 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 2015 Huntley Park escapement estimate and the resulting 2016 ROPI forecast of 136,400 consists of age-3 (102,600), age-4 (16,200) and age-5-6 (17,600) 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 2016 ROPI is below 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 2015 average density from standard survey areas was 60 adult spawners per mile, the highest since 2009 (PFMC 2016, 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 2016, 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 brights (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 brights (SAB), a stock originally from the Rogue River.

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

URB and Columbia summer Chinook are exceptions 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 URB and Columbia summer Chinook. ESA consultation standards serve the purpose of ACLs for ESA-listed stocks like LRW Chinook, and are deferred to ESA consultation standards. 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 2016 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 2015 Ocean Salmon Fisheries* (Appendix B, Tables B-15 through B-20). The 2015 returns for summer Chinook and the five fall Chinook stocks listed in this report may differ somewhat from those provided in the *Review of 2015 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 108 percent for URB, 103 percent for LRW, 110 percent for LRH, 118 percent for SCH, and 111 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 104 percent, although the 2015 return was significantly under-forecasted (58 percent).

Stock Forecasts and Status

The preliminary forecast for 2016 URB fall Chinook ocean escapement is 589,000 adults, about 74 percent of last year's return of 795,900 and about 149 percent of the recent 10-year average of 396,320. This forecast is slightly more than the 500,300 forecast in 2015 and is a continuation of strong returns that have occurred beginning in 2010. This ocean escapement will allow for significant ocean and in-river fisheries and will easily achieve 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 2016 ocean escapement of ESA-listed Snake River wild fall Chinook is 19,700 which is 82 percent of the 2015 actual return and 85 percent of the recent 5 year average return..

Ocean escapement of LRW fall Chinook in 2016 is forecast at 22,200 adults, about 138 percent of the recent 10-year average return of 16,100. The forecast is about 69 percent of last year's actual return. The spawning escapement goal of 5,700 in the North Fork Lewis River should be achieved this year.

The preliminary forecast for 2016 ocean escapement of LRH fall Chinook is for a return of 133,700 adults, about 104 percent of last year's return and 156 percent of the recent 10-year average of 85,900. Based on this abundance forecast, the total allowable LCR natural tule exploitation rate for 2016 fisheries is no greater than 41.0 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). This is the highest exploitation rate allowed under the recommended matrix.

The preliminary ocean escapement forecast of SCH fall Chinook in 2016 is 89,600 adults, about 54 percent of last year's return and 109 percent of the 10-year average of 82,100.

The preliminary forecast for the 2016 ocean escapement of MCB fall Chinook is 101,000 adults, about 59 percent of last year's return and about 90 percent of the recent 10-year average of 111,700.

The preliminary forecast for summer Chinook in 2016 is 93,300 adults, approximately 74 percent of last year's return and about 113 percent of the recent 5-year average of 83,329. This is the highest forecast in recent years. This ocean escapement should allow opportunity for both ocean and in-river fisheries and will easily exceed 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 2016 Willapa Bay natural fall Chinook ocean escapement forecast is 3,262 which is below the FMP S_{MSY} conservation objective of 3,393. The hatchery fall Chinook forecast is 36,187.

The 2016 Grays Harbor spring Chinook ocean escapement forecast is 2,709. The natural fall Chinook forecast is 27,775 which is above the FMP S_{MSY} conservation objective of 13,326. The hatchery fall Chinook forecast is 7,430.

The 2016 Queets River natural Spring/Summer Chinook and the hatchery and natural fall Chinook forecasts were unavailable at time of printing.

The 2016 Quinault River hatchery and natural fall Chinook forecasts were unavailable at time of printing.

For the Hoh River, the 2016 natural spring/summer Chinook spawning escapement is 994, above the FMP conservation objective of 900. The natural fall Chinook forecast is 1,891 which is above the FMP S_{MSY} conservation objective of 1,200.

The 2016 Quillayute hatchery spring Chinook ocean escapement forecast is 898 and the natural summer/fall Chinook forecast is 8,391 (1,831 summer and 6,560 fall). The FMP S_{MSY} conservation objectives are spawning escapements of 1,200 summer Chinook and 3,000 fall Chinook.

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.

In recent years the comanagers have developed annual fishery management plans which are provided one year exemptions from ESA section 9 take prohibitions through ESA section 7 consultations. 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 negligible, 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

There was no information available to evaluate performance of predictors for Puget Sound Chinook stocks.

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

Spring Chinook originating in Puget Sound are expected to remain depressed. Runs in the Nooksack and Dungeness rivers are of particular concern.

Summer/Fall Chinook

The 2016 preliminary forecast for Puget Sound summer/fall stocks is for a total return of 150,400 Chinook, a decrease from the 2015 preseason forecast of 194,700. The 2016 natural Chinook return forecast of 29,200 (includes supplemental category forecasts) is slightly above the 2015 forecast of 28,300.

Since ESA listing and development of the 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

No Chinook stocks were subject to overfishing or were classified as overfished in 2015. No stocks met the criteria for approaching an overfished condition in 2016 (Table V-4).

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. Selective fishing options for non-Indian fisheries are likely to be under consideration again in the ocean area from Cape Falcon, Oregon to the U.S./Canada border. Observed mark rates on Chinook in 2015 ocean fisheries in this area ranged from 59 to 85 percent. Based on preseason abundance forecasts, the expected mark rate for Chinook in this area for 2016 should be similar to those observed in 2015.

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

	SRFC Ocean Harvest South of Cape Falcon[a]					Spawning Escapement				
Year	Troll	Sport	Non-Ret[b]	Total	River Harvest	Natural	Hatchery	Total	Sacramento Index (SI)[c]	Exploitation Rate (%)[d]
1983	248.1	86.5	0.0	334.6	18.0	91.4	18.8	110.2	462.9	76
1984	266.9	87.1	0.0	353.9	25.9	119.5	39.5	159.0	538.9	70
1985	359.0	159.3	0.0	518.4	39.1	209.5	29.9	239.3	796.7	70
1986	620.1	137.5	0.0	757.6	39.2	216.3	23.8	240.1	1,036.9	77
1987	686.6	173.8	0.0	860.4	31.8	174.8	20.3	195.1	1,087.3	82
1988	1,163.0	188.3	0.0	1,351.3	37.1	198.0	29.5	227.5	1,615.9	86
1989	605.9	158.9	0.0	764.8	24.9	126.7	25.9	152.6	942.3	84
1990	507.5	150.8	0.0	658.3	17.2	83.2	21.9	105.1	780.5	87
1991	301.0	90.7	0.0	391.7	26.0 [e]	91.4	27.5	118.9	536.6	78
1992	233.3	70.1	0.0	303.4	13.3 [e]	59.5	22.1	81.5	398.3	80
1993	342.8	115.5	0.0	458.3	27.7 [e]	110.6	26.8	137.4	623.4	78
1994	303.5	168.8	0.0	472.3	28.9 [e]	133.0	32.6	165.6	666.7	75
1995	730.7	390.4	0.0	1,121.1	48.2	253.5	41.8	295.3	1,464.6	80
1996	426.8	157.0	0.0	583.8	49.2	267.1	34.6	301.6	934.7	68
1997	579.7	210.3	0.0	790.1	56.3	279.6	65.2	344.8	1,191.2	71
1998	292.3	113.9	0.0	406.3	69.8 [e]	168.1	77.8	245.9	722.0	66
1999	289.1	76.3	0.0	365.4	68.9 [e]	353.7	46.1	399.8	834.1	52
2000	423.1	152.8	0.0	576.0	59.5 [e]	369.2	48.3	417.5	1,053.0	60
2001	285.2	94.3	0.0	379.5	97.4	537.4	59.4	596.8	1,073.7	44
2002	454.2	185.1	0.0	639.3	89.2 [e]	682.7	87.2	769.9	1,498.4	49
2003	506.6	106.8	0.0	613.4	85.4	413.4	109.6	523.0	1,221.7	57
2004	622.1	213.0	0.0	835.1	46.8	203.5	83.4	286.9	1,168.8	75
2005	370.3	127.6	0.0	497.9	64.6	210.7	185.3	396.0	958.6	59
2006	149.9	107.9	0.0	257.8	44.9	195.1	79.9	275.0	577.7	52

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/]
2007	120.0	32.0	0.0	152.0	14.3 [e/]	70.0	21.4	91.4	257.7	65
2008	3.2	0.9	0.0	4.1	0.1 [e/]	46.9	18.5	65.4	69.6	6
2009	0.0	0.2	0.1	0.3	0.0 [e/]	23.3	17.5	40.9	41.1	1
2010	11.8	11.4	0.3	23.5	2.5 [e/]	84.6	39.7	124.3	150.3	17
2011	46.7	22.9	0.0	69.6	17.4 [e/]	76.5	42.9	119.3	206.3	42
2012	184.0	93.5	0.3	277.7	62.2 [e/]	163.2	122.3	285.4	625.3	54
2013	292.1	114.4	0.0	406.5	55.5 [e/]	301.5	104.7	406.2	868.2	53
2014	242.6	62.5	0.0	305.1	35.7 [e/]	167.7	44.7	212.5	553.3	62
2015[f/]	100.6	24.5	0.0	125.1	17.7 [e/]	73.1	39.3	112.4	255.3	56

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/]	Maximum Allowable (%)	Preseason Forecast (%)	Postseason Estimate (%)
2000	--	--	-	-	21.4
2001	8,224	--	-	-	23.0
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	17,149	10,080	-	-	15.1
2007	2,533	12,881	-	-	17.8
2008	2,725	8,828	-	-	0.0
2009	4,416	4,910	-	-	0.0
2010	1,596	3,124	-	-	- [c/]
2011	824	2,678	-	-	28.3
2012	2,671	1,797	13.7	13.7	13.0
2013	6,085	1,520	12.9	12.9	18.9
2014	3,015	2,375	15.4	15.4	15.5 [d/]
2015	3,439	3,659	19.0	17.5	NA [e/]
2016	NA	3,981	19.9	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., 2014 GM computed from 2011-2013 escapement).
c/ Insufficient data for postseason estimate.
d/ Preliminary: incomplete cohort data (age-4 escapement unavailable).
e/ 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.

	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	0.2	187.4
2002	513.4	98.9	612.4	0.02	0.15	9.2	94.6	62.5	3.7	160.8
2003	399.4	192.1	591.5	0.08	0.21	3.8	94.3	96.8	0.9	191.9
2004	159.4	104.6	264.1	0.12	0.34	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	376.8	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
2011	240.2	64.6	304.8	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	436.8	194.4	631.2	0.04	0.20	14.4	55.2	108.8	1.1	165.0
2014	224.0[a/]	179.9	404.0	0.03[a/]	0.17	22.3	57.8	98.7	3.9	160.4
2015	175.7[b/]	65.5[a/]	241.2	NA[c/]	0.21[a/]	6.1	36.7	33.9	7.1	77.7

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	276,000	0.41
1986	426,000[b/]	1,304,409	0.33
1987	511,800	781,123	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	513,435	0.41
2003	171,300	399,414	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	376,840	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	240,239	1.27
2012	1,567,600	798,974	1.96
2013	390,700	436,819	0.89
2014	219,800	224,031	0.98
2015[c/]	342,200	175,694	1.95
2016	93,400	--	--

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	56,875	57,500	0.99
1986	66,250	140,823	0.47
1987	206,125	341,875	0.60
1988	186,375	234,751	0.79
1989	215,500	177,245	1.22
1990	50,125	103,951	0.48
1991	44,625	37,171	1.20
1992	44,750	28,169	1.59
1993	39,125	15,037	2.60
1994	86,125	41,736	2.06
1995	47,000	28,726	1.64
1996	268,500	226,282	1.19
1997	53,875	62,820	0.86
1998	46,000	44,733	1.03
1999	78,750	30,456	2.59
2000	38,875	44,176	0.88
2001	247,000	133,801	1.85
2002	143,800	98,927	1.45
2003	132,400	192,085	0.69
2004	134,500	104,636	1.29
2005	48,900	38,079	1.28
2006	63,700	63,383	1.01
2007	26,100	33,615	0.78
2008	157,200	81,366	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	74,332	1.07
2013	331,200	194,354	1.70
2014	67,400	179,922	0.37
2015[c/]	71,100	65,545	1.08
2016	45,100	--	--

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	5,250	19,414	0.27
1988	13,250	14,632	0.91
1989	10,125	9,612	1.05
1990	7,625	7,767	0.98
1991	1,500	2,774	0.54
1992	1,250	1,444	0.87
1993	1,125	1,759	0.64
1994	500	1,468	0.34
1995	2,000	3,805	0.53
1996	1,125	788	1.43
1997	7,875	9,004	0.87
1998	3,250	2,382	1.36
1999	2,000	2,106	0.95
2000	1,375	1,051	1.31
2001	1,250	258	4.84
2002	9,700	6,933	1.40
2003	6,500	1,915	3.39
2004	9,700	17,128	0.57
2005	5,200	6,857	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	3,974	1.43
2014	12,100	7,607	1.59
2015[c/]	10,400	13,174	0.79
2016	3,700	--	--

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	169,875[d/]	344,613	0.49
1986	492,250[d/]	1,451,608	0.34
1987	723,175	1,142,412	0.63
1988	570,425	1,005,644	0.57
1989	676,225	556,685	1.21
1990	536,750	287,840	1.86
1991	222,325	109,369	2.03
1992	96,000	69,115	1.39
1993	334,650	185,269	1.81
1994	224,625	163,119	1.38
1995	318,000	819,840	0.39
1996	749,425	419,342	1.79
1997	286,350	211,977	1.35
1998	225,250	201,914	1.12
1999	165,550	161,628	1.02
2000	389,850	662,324	0.59
2001	435,450	490,187	0.89
2002	362,500	619,295	0.59
2003	310,200	593,414	0.52
2004	216,300	281,210	0.77
2005	239,800	234,912	1.02
2006	110,000	159,225	0.69
2007	546,200	413,366	1.32
2008	190,700	152,269	1.25
2009	505,700	268,896	1.88
2010	331,500	255,369	1.30
2011	371,200	307,560	1.21
2012	1,651,800	878,416	1.88
2013	727,600	635,147	1.15
2014	299,300	411,560	0.73
2015[c/]	423,800	254,413	1.67
2016	142,200	--	--

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.

	Preseason Ocean Abundance Forecast[a/] Sept. 1 (t-1)		Postseason Ocean Abundance Estimate Sept. 1 (t-1)		Preseason Age-4 Harvest Rate Forecast[b/]		Postseason Age-4 Harvest Rate Estimate[c/]		Preseason Adult Harvest Forecast		Postseason Adult Harvest Estimate	
Year(t)	Age-3	Age-4	Age-3	Age-4	Ocean	River	Ocean	River	Ocean	River	Ocean	River
1986	426,000	66,250	1,304,409	140,823	0.28	0.50	0.46	0.67	72,000	37,700	301,999	46,154
1987	511,800	206,125	781,123	341,875	0.28	0.53	0.43	0.44	121,200	78,200	277,203	73,265
1988	370,800	186,375	756,261	234,751	0.31	0.53	0.39	0.52	114,100	65,400	253,888	73,854
1989	450,600	215,500	369,828	177,245	0.30	0.49	0.36	0.70	128,100	67,600	125,117	54,340
1990	479,000	50,125	176,122	103,951	0.30	0.49	0.55	0.36	85,100	31,200	114,780	11,459
1991	176,200	44,625	69,424	37,171	0.13	0.28	0.18	0.45	16,700	12,800	9,871	13,581
1992	50,000	44,750	39,502	28,169	0.06	0.15	0.07	0.27	4,200	4,200	3,142	6,787
1993	294,400	39,125	168,473	15,037	0.12	0.43	0.16	0.49	20,100	22,500	11,355	12,808
1994	138,000	86,125	119,915	41,736	0.07	0.20	0.09	0.29	10,400	14,300	7,961	13,524
1995	269,000	47,000	787,309	28,726	0.07	0.32	0.14	0.19	13,500	18,500	33,146	21,637
1996	479,800	268,500	192,272	226,282	0.17	0.66	0.16	0.39	88,400	129,100	45,637	69,241
1997	224,600	53,875	140,153	62,820	0.10	0.43	0.06	0.26	17,600	26,500	8,987	17,764
1998	176,000	46,000	154,799	44,733	0.07	0.29	0.09	0.30	10,200	14,800	4,891	17,897
1999	84,800	78,750	129,066	30,456	0.10	0.28	0.09	0.45	12,300	18,100	5,116	16,942
2000	349,600	38,875	617,097	44,176	0.11	0.53	0.10	0.25	24,000	32,400	42,050	35,066
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	513,435	98,927	0.13	0.57	0.15	0.26	30,000	70,900	28,892	35,069
2003	171,300	132,400	399,414	192,085	0.16	0.50	0.21	0.28	30,600	52,200	70,604	39,715
2004	72,100	134,500	159,446	104,636	0.15	0.38	0.34	0.48	26,500	35,800	63,703	29,807
2005	185,700	48,900	189,976	38,079	0.08	0.16	0.20	0.19	7,100	9,600	12,826	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	376,840	33,615	0.16	0.63	0.21	0.56	30,200	51,400	30,244	33,884
2008	31,600	157,200	68,003	81,366	0.02	0.43	0.10	0.38	4,500	49,500	8,679	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	240,239	64,568	0.16	0.54	0.08	0.34	26,900	42,700	11,998	30,502
2012	1,567,600	79,600	798,974	74,332	0.16	0.77	0.08	0.51	92,400	227,600	34,727	109,263
2013	390,700	331,200	436,819	194,354	0.16	0.62	0.20	0.51	74,800	154,800	59,432	82,835
2014	219,800	67,400	224,031	179,922	0.16	0.40	0.17	0.25	23,200	31,400	39,754	31,353
2015[d/]	342,200	71,100	175,694	65,545	0.16	0.59	0.21	0.47	29,400	57,700	20,939	35,815
2016	93,400	45,100	-	-	-	-	-	-	-	-	-	-

a/ Original preseason forecasts for years 1986-2001 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), 1986-2001, 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 (assumed age-4 survival rate between Sept. 1 (t-1) and May 1 (t)

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.

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

	Ocean Fisheries (Sept. 1 (t-1) - Aug. 31 (t))							River Fisheries (t)		
	KMZ			North of	South of					
Year (t)	Troll	Sport	Subtotal	KMZ	KMZ	Subtotal	Ocean Total	Net	Sport	Total
					HARVEST (numbers of fish)					
Age-3										
1986	35,632	4,876	40,508	73,777	122,913	196,690	237,198	8,100	18,100	26,200
1987	17,237	5,082	22,319	43,432	56,368	99,800	122,119	11,400	11,400	22,800
1988	15,999	5,165	21,164	24,317	107,971	132,288	153,452	12,500	15,600	28,100
1989	6,456	11,783	18,239	15,315	23,729	39,044	57,283	2,700	900	3,600
1990	81	4,357	4,438	36,575	11,004	47,579	52,017	1,300	1,400	2,700
1991	0	1,022	1,022	344	810	1,154	2,176	2,123	1,277	3,400
1992	0	0	0	972	0	972	972	970	251	1,221
1993	0	822	822	833	6,424	7,257	8,079	5,426	2,917	8,343
1994	42	604	646	0	3,387	3,387	4,033	4,543	965	5,508
1995	0	999	999	13,126	14,808	27,934	28,933	11,840	5,536	17,376
1996	0	0	0	0	9,314	9,314	9,314	12,363	3,661	16,024
1997	0	232	232	620	1,215	1,835	2,067	2,166	2,736	4,902
1998	0	6	6	298	466	764	770	2,231	5,781	8,012
1999	63	180	243	1,262	433	1,695	1,938	4,981	1,748	6,729
2000	404	3,282	3,686	8,604	25,203	33,807	37,493	22,458	4,893	27,351
2001	113	105	218	2,749	6,082	8,831	9,049	17,885	7,294	25,179
2002	220	783	1,003	1,500	9,913	11,413	12,416	11,734	6,258	17,992
2003	172	678	850	1,881	27,249	29,130	29,980	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	8,099	8,869	4,193	9,365	13,558	22,427	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	1,120	1,454	35	4,832	4,867	6,321	13,286	2,630	15,916
2012	1,121	11,350	12,471	926	13,090	14,016	26,487	70,409	12,104	82,513
2013	390	5,571	5,961	865	11,979	12,844	18,805	18,996	7,675	26,671
2014[a/]	0	582	582	4,124	1,594	5,718	6,300	3,386	1,778	5,164
2015[a/]	54	330	384	733	1,787	2,520	2,904	10,592	4,482	15,074

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

	Ocean Fisheries (Sept. 1 (t-1) - Aug. 31 (t))							River Fisheries (t)		
	KMZ			North of	South of					
Year (t)	Troll	Sport	Subtotal	KMZ	KMZ	Subtotal	Ocean Total	Net	Sport	Total
HARVEST (numbers of fish)										
Age-4										
1986	7,745	1,113	8,858	23,486	31,913	55,399	64,257	17,000	2,900	19,900
1987	21,736	4,427	26,163	70,645	48,832	119,477	145,640	41,000	8,500	49,500
1988	11,868	3,595	15,463	26,376	50,287	76,663	92,126	38,600	6,200	44,800
1989	6,064	9,735	15,799	32,116	16,608	48,724	64,523	41,000	7,700	48,700
1990	3,997	2,919	6,916	39,627	10,624	50,251	57,167	6,000	2,200	8,200
1991	0	1,001	1,001	1,513	4,134	5,647	6,648	7,593	2,016	9,609
1992	171	55	226	1,783	12	1,795	2,021	4,360	723	5,083
1993	0	0	0	849	1,616	2,465	2,465	3,786	243	4,029
1994	0	1,124	1,124	1,168	1,499	2,667	3,791	6,666	818	7,484
1995	0	242	242	1,879	1,771	3,650	3,892	2,957	480	3,437
1996	866	3,457	4,323	10,776	20,698	31,474	35,797	43,959	9,080	53,039
1997	3	172	175	463	2,994	3,457	3,632	8,734	2,586	11,320
1998	0	105	105	3,942	0	3,942	4,047	7,164	1,822	8,986
1999	15	381	396	1,657	696	2,353	2,749	8,789	494	9,283
2000	117	895	1,012	2,327	1,076	3,403	4,415	6,733	756	7,489
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	918	1,752	7,852	29,996	37,848	39,600	22,754	4,592	27,346
2004	1,416	1,210	2,626	11,458	21,862	33,320	35,946	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	6,376	1,105	7,481	546	113	659	8,140	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	2,088	2,424	760	2,959	3,719	6,143	23,285	1,718	25,003
2013	4,265	6,236	10,501	4,036	23,995	28,031	38,532	43,671	12,043	55,714
2014	1,295	1,433	2,728	19,397	8,973	28,370	31,098	21,303	3,404	24,707
2015[a/]	286	206	492	6,040	7,460	13,500	13,992	13,146	2,676	15,822

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

	Ocean Fisheries (Sept. 1 (t-1) - Aug. 31 (t))							River Fisheries (t)		
	KMZ			North of	South of					
Year (t)	Troll	Sport	Subtotal	KMZ	KMZ	Subtotal	Ocean Total	Net	Sport	Total
					HARVEST RATE[b/]					
Age-3										
1986	0.03	0.00	0.03	0.06	0.09	0.15	0.18	0.05	0.11	0.16
1987	0.02	0.01	0.03	0.06	0.07	0.13	0.16	0.13	0.13	0.25
1988	0.02	0.01	0.03	0.03	0.14	0.17	0.20	0.12	0.15	0.28
1989	0.02	0.03	0.05	0.04	0.06	0.11	0.15	0.05	0.02	0.07
1990	0.00	0.02	0.03	0.21	0.06	0.27	0.30	0.11	0.12	0.23
1991	0.00	0.01	0.01	0.00	0.01	0.02	0.03	0.21	0.13	0.34
1992	0.00	0.00	0.00	0.02	0.00	0.02	0.02	0.14	0.04	0.18
1993	0.00	0.00	0.00	0.00	0.04	0.04	0.05	0.11	0.06	0.17
1994	0.00	0.01	0.01	0.00	0.03	0.03	0.03	0.12	0.03	0.15
1995	0.00	0.00	0.00	0.02	0.02	0.04	0.04	0.06	0.03	0.09
1996	0.00	0.00	0.00	0.00	0.05	0.05	0.05	0.32	0.09	0.41
1997	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.06	0.08	0.14
1998	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.10	0.14
1999	0.00	0.00	0.00	0.01	0.00	0.01	0.02	0.17	0.06	0.23
2000	0.00	0.01	0.01	0.01	0.04	0.05	0.06	0.12	0.03	0.15
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[a/]	0.00	0.00	0.00	0.02	0.01	0.03	0.03	0.06	0.03	0.09
2015[a/]	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.29	0.12	0.41

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

	Ocean Fisheries (Sept. 1 (t-1) - Aug. 31 (t))							River Fisheries (t)		
	KMZ			North of	South of					
Year (t)	Troll	Sport	Subtotal	KMZ	KMZ	Subtotal	Ocean Total	Net	Sport	Total
					HARVEST RATE[b/]					
Age-4										
1986	0.05	0.01	0.06	0.17	0.23	0.39	0.46	0.57	0.10	0.67
1987	0.06	0.01	0.08	0.21	0.14	0.35	0.43	0.36	0.08	0.44
1988	0.05	0.02	0.07	0.11	0.21	0.33	0.39	0.45	0.07	0.52
1989	0.03	0.05	0.09	0.18	0.09	0.27	0.36	0.59	0.11	0.70
1990	0.04	0.03	0.07	0.38	0.10	0.48	0.55	0.26	0.10	0.36
1991	0.00	0.03	0.03	0.04	0.11	0.15	0.18	0.35	0.09	0.45
1992	0.01	0.00	0.01	0.06	0.00	0.06	0.07	0.23	0.04	0.27
1993	0.00	0.00	0.00	0.06	0.11	0.16	0.16	0.46	0.03	0.49
1994	0.00	0.03	0.03	0.03	0.04	0.06	0.09	0.26	0.03	0.29
1995	0.00	0.01	0.01	0.07	0.06	0.13	0.14	0.16	0.03	0.19
1996	0.00	0.02	0.02	0.05	0.09	0.14	0.16	0.32	0.07	0.39
1997	0.00	0.00	0.00	0.01	0.05	0.06	0.06	0.20	0.06	0.26
1998	0.00	0.00	0.00	0.09	0.00	0.09	0.09	0.24	0.06	0.30
1999	0.00	0.01	0.01	0.05	0.02	0.08	0.09	0.43	0.02	0.45
2000	0.00	0.02	0.02	0.05	0.02	0.08	0.10	0.22	0.02	0.25
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	0.34	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[a/]	0.00	0.00	0.01	0.09	0.11	0.21	0.21	0.39	0.08	0.47

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 Year	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/]			
	Age-2	Age-3	Age-4	Age-5-6	Total[d/]	Age-3	Age-4-6	Age-3	Age-4	Age-5-6	Total
1982	37.4	36.3	58.9	3.9	136.5	0.30	0.52	321.5	118.7	15.1	455.3
1983	6.9	22.7	15.7	1.4	46.7	0.19	0.60	452.0	86.1	43.7	581.8
1984	10.0	16.2	15.6	1.5	43.3	0.08	0.38	83.8	53.9	11.7	149.4
1985	51.4	9.7	23.1	4.2	88.4	0.11	0.24	121.1	38.3	11.6	171.0
1986	87.3	116.2	26.5	3.9	233.9	0.18	0.46	622.5	23.1	17.9	663.5
1987	32.7	61.9	56.6	4.4	155.6	0.16	0.43	1,056.3	275.3	20.2	1,351.8
1988	12.8	17.7	54.0	4.7	89.2	0.20	0.39	395.1	146.7	42.2	584.0
1989	16.2	30.7	40.0	8.2	95.1	0.15	0.36	155.0	41.9	40.4	237.3
1990	4.8	9.7	10.4	1.4	26.3	0.30	0.55	195.9	72.8	30.7	299.4
1991	3.9	10.1	6.6	0.7	21.3	0.03	0.18	58.4	23.1	7.9	89.4
1992	33.1	18.5	22.1	6.1	79.8	0.02	0.07	47.3	24.0	5.0	76.3
1993	12.0	31.5	6.8	2.4	52.7	0.05	0.16	400.7	43.8	17.0	461.5
1994	14.4	38.2	31.3	3.9	87.8	0.03	0.09	145.3	74.6	5.5	225.4
1995	20.2	46.1	19.4	4.6	90.3	0.04	0.14	174.0	90.4	23.7	288.1
1996	16.8	26.1	23.3	2.7	68.9	0.05	0.16	244.9	109.2	15.2	369.3
1997	18.6	23.7	14.8	4.3	61.4	0.01	0.06	202.7	62.0	17.5	282.2
1998	7.1	29.0	12.9	1.2	50.2	0.01	0.09	224.9	56.3	11.8	293.0
1999	19.6	15.5	16.9	6.8	58.8	0.02	0.09	86.5	68.6	9.7	164.8
2000	13.6	61.7	23.0	7.8	106.1	0.06	0.10	236.7	36.8	13.7	287.2
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	484.2
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	132.8
2008	16.2	7.6	14.1	4.2	42.1	0.00	0.10	41.3	37.6	15.4	94.3
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 [e/]	0.17	295.5 [e/]	40.5 [e/]	49.0 [f/]	385.0 [e/]
2015	8.5	6.8	23.1	3.0	41.4	-	0.21 [e/]	151.5 [e/]	48.5 [f/]	22.8 [f/]	222.8 [f/]
2016	NA	NA	NA	NA	NA	-	-	102.6 [f/]	16.2 [f/]	17.6 [f/]	136.4 [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	March Preseason Forecast[a/]	April STT Modeled Forecast[b/]	Postseason Return	March Pre/Postseason	April Pre/Postseason
			URB		
1990	127.20	126.90	153.60	0.83	0.83
1991	88.80	88.90	103.30	0.86	0.86
1992	68.40	66.30	81.00	0.84	0.82
1993	84.50	82.70	102.90	0.82	0.80
1994	85.40	94.70	132.80	0.64	0.71
1995	103.70	125.00	106.50	0.97	1.17
1996	88.90	94.20	143.20	0.62	0.66
1997	166.40	158.00	161.70	1.03	0.98
1998	150.80	141.80	142.30	1.06	1.00
1999	147.50	102.10	166.10	0.89	0.61
2000	171.10	208.20	155.70	1.10	1.34
2001	127.20	132.70	232.60	0.55	0.57
2002	281.00	273.80	276.90	1.01	0.99
2003	280.40	253.20	373.20	0.75	0.68
2004	292.20	287.00	367.90	0.79	0.78
2005	352.20	354.60	268.70	1.31	1.32
2006	253.90	249.10	230.40	1.10	1.08
2007	182.40	185.20	112.60	1.62	1.64
2008	162.50	165.90	196.90	0.83	0.84
2009	259.90	269.80	212.00	1.23	1.27
2010	310.80	319.10	324.90	0.96	0.98
2011	398.20	399.50	324.10	1.23	1.23
2012	353.50	353.00	298.10	1.19	1.18
2013	432.50	434.72	784.10	0.55	0.55
2014	973.30	919.40	684.20	1.42	1.34
2015[c/]	500.30	516.20	795.90	0.63	0.65
2016	589.00	-	-	-	-
			LRW		
1990	23.70	23.40	20.30	1.17	1.15
1991	12.70	12.70	19.80	0.64	0.64
1992	17.40	16.70	12.50	1.39	1.34
1993	12.50	11.90	13.30	0.94	0.89
1994	14.70	13.20	12.20	1.20	1.08
1995	12.40	11.50	16.00	0.78	0.72
1996	8.80	8.10	14.60	0.60	0.55
1997	7.50	7.20	12.30	0.61	0.59
1998	8.10	7.00	7.30	1.11	0.96
1999	2.60	2.50	3.30	0.79	0.76
2000	3.50	2.70	10.20	0.34	0.26
2001	16.70	18.50	15.70	1.06	1.18
2002	18.70	18.30	24.90	0.75	0.73
2003	24.60	23.40	26.00	0.95	0.90
2004	24.10	24.20	22.30	1.08	1.09
2005	20.20	21.40	16.80	1.20	1.27
2006	16.60	16.60	18.10	0.92	0.92
2007	10.10	10.00	4.30	2.35	2.33
2008	3.80	3.80	7.10	0.54	0.54
2009	8.50	8.60	7.50	1.13	1.15
2010	9.70	10.00	10.90	0.89	0.92
2011	12.50	13.10	15.20	0.82	0.86
2012	16.20	16.20	13.90	1.17	1.17
2013	14.20	14.28	25.80	0.55	0.55
2014	34.20	33.40	25.80	1.33	1.29
2015[c/]	18.90	19.35	32.40	0.58	0.60
2016	22.20	-	-	-	-

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		
1990	68.50	65.50	60.00	1.14	1.09
1991	71.40	73.10	62.70	1.14	1.17
1992	113.20	121.50	62.60	1.81	1.94
1993	79.30	77.70	52.30	1.52	1.49
1994	36.10	46.50	53.60	0.67	0.87
1995	35.80	42.40	46.40	0.77	0.91
1996	37.70	48.30	75.50	0.50	0.64
1997	54.20	68.70	57.40	0.94	1.20
1998	19.20	22.50	45.30	0.42	0.50
1999	34.80	38.20	40.00	0.87	0.96
2000	23.70	26.40	27.00	0.88	0.98
2001	32.20	30.50	94.30	0.34	0.32
2002	137.60	133.00	156.40	0.88	0.85
2003	115.90	116.90	155.00	0.75	0.75
2004	77.10	79.00	108.90	0.71	0.73
2005	74.10	78.44	78.30	0.95	1.00
2006	55.80	57.50	58.30	0.96	0.99
2007	54.90	54.40	32.70	1.68	1.66
2008	59.00	55.90	60.30	0.98	0.93
2009	88.80	88.20	76.70	1.16	1.15
2010	90.60	85.60	103.00	0.88	0.83
2011	133.50	128.90	109.00	1.22	1.18
2012	127.00	128.40	84.80	1.50	1.51
2013	88.00	87.44	103.20	0.85	0.85
2014	110.00	100.70	101.80	1.08	0.99
2015[c/]	94.90	96.76	128.70	0.74	0.75
2016	133.70	-	-	-	-
			SCH		
1991	56.30	61.40	52.40	1.07	1.17
1992	40.90	41.30	29.50	1.39	1.40
1993	19.90	18.20	16.80	1.18	1.08
1994	20.20	28.90	18.50	1.09	1.56
1995	17.50	22.50	33.80	0.52	0.67
1996	27.60	35.40	33.10	0.83	1.07
1997	21.90	25.70	27.40	0.80	0.94
1998	14.20	14.20	20.20	0.70	0.70
1999	65.80	61.00	50.20	1.31	1.22
2000	21.90	26.90	20.50	1.07	1.31
2001	56.60	61.90	125.00	0.45	0.50
2002	144.40	136.00	160.80	0.90	0.85
2003	96.90	101.90	180.60	0.54	0.56
2004	138.00	150.00	175.30	0.79	0.86
2005	114.10	115.79	93.10	1.23	1.24
2006	50.00	51.80	27.90	1.79	1.86
2007	21.80	21.30	14.60	1.49	1.46
2008	87.20	86.20	91.90	0.95	0.94
2009	59.30	56.50	49.00	1.21	1.15
2010	169.00	162.90	130.80	1.29	1.25
2011	116.40	116.70	70.10	1.66	1.66
2012	63.80	60.00	56.80	1.12	1.06
2013	38.00	36.72	86.60	0.44	0.42
2014	115.10	103.30	127.00	0.91	0.81
2015[c/]	160.50	163.89	166.40	0.96	0.98
2016	89.50	-	-	-	-

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		
1990	69.50	69.30	58.90	1.18	1.18
1991	48.40	48.50	35.40	1.37	1.37
1992	42.50	40.70	31.10	1.37	1.31
1993	33.00	32.30	27.50	1.20	1.17
1994	23.90	26.70	33.70	0.71	0.79
1995	25.00	30.00	34.20	0.73	0.88
1996	40.80	43.20	59.70	0.68	0.72
1997	72.10	61.90	59.00	1.22	1.05
1998	47.80	44.90	36.80	1.30	1.22
1999	38.30	27.70	50.70	0.76	0.55
2000	50.60	61.60	36.80	1.38	1.67
2001	43.50	45.30	76.40	0.57	0.59
2002	96.20	91.80	108.40	0.89	0.85
2003	104.80	94.60	150.20	0.70	0.63
2004	90.40	88.80	117.60	0.77	0.76
2005	89.40	89.73	98.00	0.91	0.92
2006	88.30	86.60	80.40	1.10	1.08
2007	68.00	69.10	46.90	1.45	1.47
2008	54.00	55.10	75.50	0.72	0.73
2009	94.40	97.90	73.10	1.29	1.34
2010	79.00	74.60	79.00	1.00	0.94
2011	100.00	100.40	85.40	1.17	1.18
2012	90.80	90.70	58.70	1.55	1.55
2013	105.20	96.33	243.40	0.43	0.40
2014	360.10	340.20	203.80	1.77	1.67
2015[c/]	113.30	116.90	170.60	0.66	0.69
2016	101.00	-	-	-	-
			SUMMER		
2008	52.00		55.53	0.94	
2009	70.70		53.88	1.31	
2010	88.80		72.35	1.23	
2011	91.10		80.57	1.13	
2012	91.20	92.60	58.30	1.56	1.59
2013	73.50	78.50	67.57	1.09	1.16
2014	67.50	64.70	78.30	0.86	0.83
2015[c/]	73.00	100.10	126.90	0.58	0.79
2016	93.30	-	-	-	-

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	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	50.4	32.3	1.53	3.2	3.8	0.84	1.0	1.4	0.71	14.0	6.9	2.00
1994	46.6	28.1	1.66	3.2	0.7	4.00	1.3	5.5	0.30	8.4	5.9	1.27
1995	38.5	22.3	1.73	3.5	0.2	17.50	1.6	3.4	0.48	5.0	9.2	0.52
1996	27.0	29.2	0.92	1.7	0.5	2.43	1.0	1.2	0.83	7.1	10.9	0.58
1997	34.0	41.7	0.99	1.2	1.2	1.00	0.1	0.0	-	6.4	6.1	1.03
1998	28.0	31.5	0.95	0.5	0.3	1.67	0.0	0.0	-	6.6	15.0	0.44
1999	27.0	42.1	0.66	2.3	0.3	7.67	0.0	0.0	-	7.6	5.3	1.46
2000	19.0	32.6	0.57	5.0	0.1	50.00	0.0	0.0	-	7.3	17.3	0.42
2001	34.9	65.6	0.55	1.6	0.9	16.00	0.0	0.0	-	9.1	14.1	0.65
2002	52.8	57.0	0.99	1.6	0.9	2.29	0.0	0.1	-	13.8	20.0	0.69
2003	45.8	30.0	1.51	1.6	0.2	8.00	0.0	0.3	-	13.7	10.3	1.38
2004	34.2	18.1	1.83	0.8	0.0	200.00	0.5	0.0	-	20.3	24.3	0.83
2005	19.5	16.5	1.07	0.4	0.0	13.33	0.7	0.4	3.50	23.4	23.4	0.99
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	0.00	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	32.1	1.37	0.4	1.6	0.25	1.3	0.1	13.00	8.3	15.8	0.53
2013	47.2	32.8	1.44	2.0	1.1	1.82	0.3	0.1	3.00	12.9	13.0	0.99
2014	43.9	22.4	1.96	1.2	0.3	4.00	0.3	0.0	7.50	18.0	10.1	1.78
2015[b]	38.6	NA	NA	1.2	NA	NA	0.6	NA	NA	11.8	NA	NA
2016	27.9	-	-	0.7	-	-	0.4	-	-	15.1	-	-

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	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	NA	1.3	-	`	2.7	0.58	4.9	5.5	0.89	2.8	1.4	2.03
1994	NA	1.3	-	1.8	5.4	0.33	4.5	5.0	0.90	2.8	1.8	1.59
1995	1.8	0.9	1.92	2.2	4.0	0.54	4.3	4.0	1.08	2.3	8.5	0.27
1996	1.3	1.2	1.04	6.7	4.6	1.47	4.2	5.9	0.71	2.7	11.5	0.24
1997	1.6	1.2	1.36	7.7	12.0	0.64	5.2	4.4	1.19	4.0	8.7	0.46
1998	1.6	1.6	1.03	6.5	4.7	1.37	5.6	6.4	0.88	2.5	7.2	0.35
1999	1.5	1.1	1.36	7.8	4.7	1.65	5.6	4.8	1.16	4.5	15.2	0.30
2000	2.0	1.7	1.21	6.2	1.9	3.20	6.0	6.1	0.98	5.0	8.3	0.60
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	1.19	10.1	6.4	1.58	15.7	11.2	1.40	6.8	6.5	1.05
2005	2.0	1.2	1.42	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[b]	0.5	NA	NA	3.3	NA	NA	4.2	NA	NA	1.3	-	-
2016	0.3	-	-	5.0	-	-	3.3	-	-	1.4	-	-

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	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	61.8	43.1	1.68	26.5	9.6	1.34	0.7	1.0	3.50	3.1	1.6	1.29
1994	52.7	49.9	1.08	18.0	10.5	0.60	3.9	1.2	2.44	1.0	1.0	2.00
1995	49.6	75.4	0.67	21.7	24.9	0.63	3.0	0.7	30.00	0.9	2.3	0.33
1996	51.9	53.2	0.89	19.0	16.5	0.53	2.8	1.4	14.00	0.9	2.0	0.29
1997	65.1	38.3	1.40	18.2	15.9	0.88	2.2	1.0	7.33	0.8	2.9	0.23
1998	67.8	49.6	1.24	21.8	14.6	0.79	1.7	1.7	1.00	0.9	2.1	0.47
1999	59.4	67.3	0.71	19.6	33.5	1.15	1.9	0.7	2.71	0.9	2.7	0.33
2000	77.5	47.4	1.39	17.5	39.5	1.26	2.0	1.2	1.67	1.1	1.7	0.65
2001	73.7	76.6	0.76	16.2	60.6	0.80	0.0	1.7	0.00	3.5	2.0	1.75
2002	90.8	69.3	1.07	16.9	57.0	0.79	0.0	1.6	0.00	3.6	2.2	0.97
2003	86.6	57.2	1.14	19.6	38.6	1.28	0.0	1.3	0.00	3.4	2.8	0.72
2004	86.5	66.6	1.16	17.5	42.3	0.61	0.0	1.4	0.00	3.6	4.1	0.85
2005	83.1	73.9	0.95	17.7	19.0	0.46	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[b/]	62.4	NA	NA	3.8	NA	NA	4.9	NA	NA	3.5	NA	NA
2016	43.1	-	-	4.5	-	-	4.3	-	-	2.3	-	-

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	Preseason Forecast	Postseason Return	Pre/Post-season
	Hood Canal Hatchery and Natural		
1993	NA	9.2	-
1994	11.7	8.1	1.44
1995	11.5	7.8	1.47
1996	3.9	16.2	0.24
1997	9.0	30.2	0.30
1998	2.7	20.9	0.13
1999	6.7	30.4	0.22
2000	14.0	34.4	0.41
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	3.3
2015[b/]	62.1	NA	NA
2016	45.0	-	-

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.

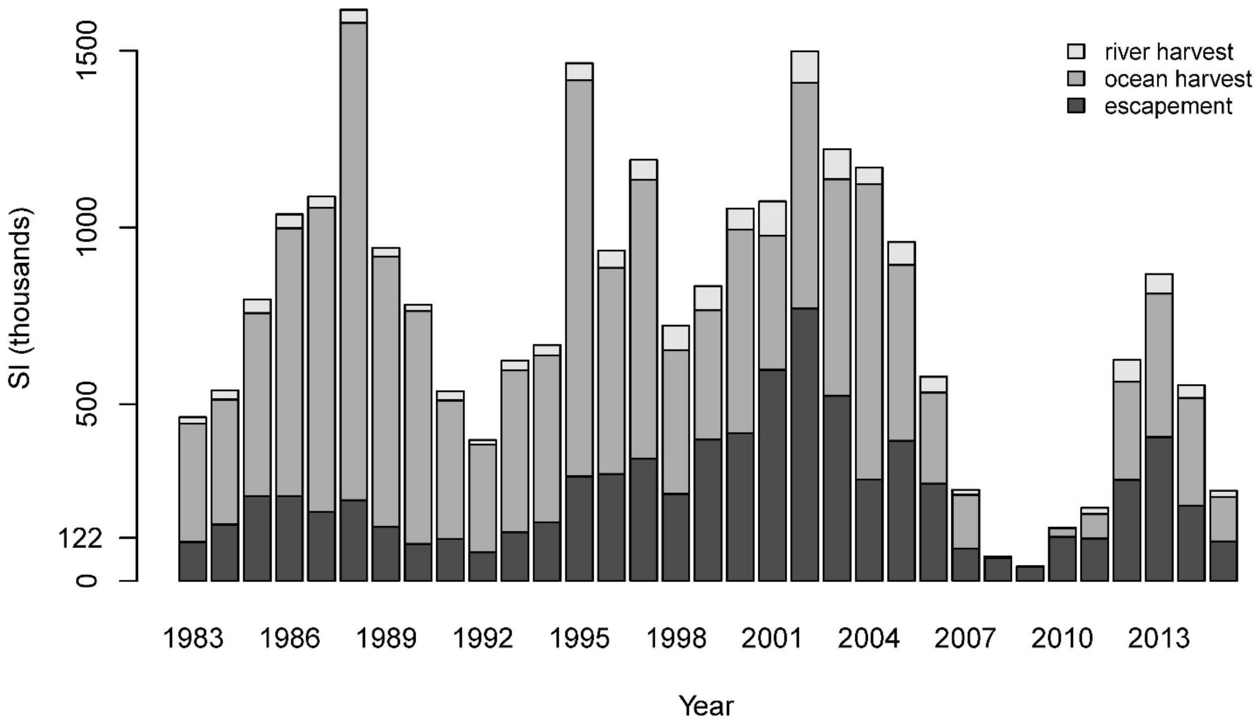

FIGURE II-1. The Sacramento Index (SI) and relative levels of its components. The Sacramento River fall Chinook S_{MSY} of 122,000 adult spawners is noted on the vertical axis.

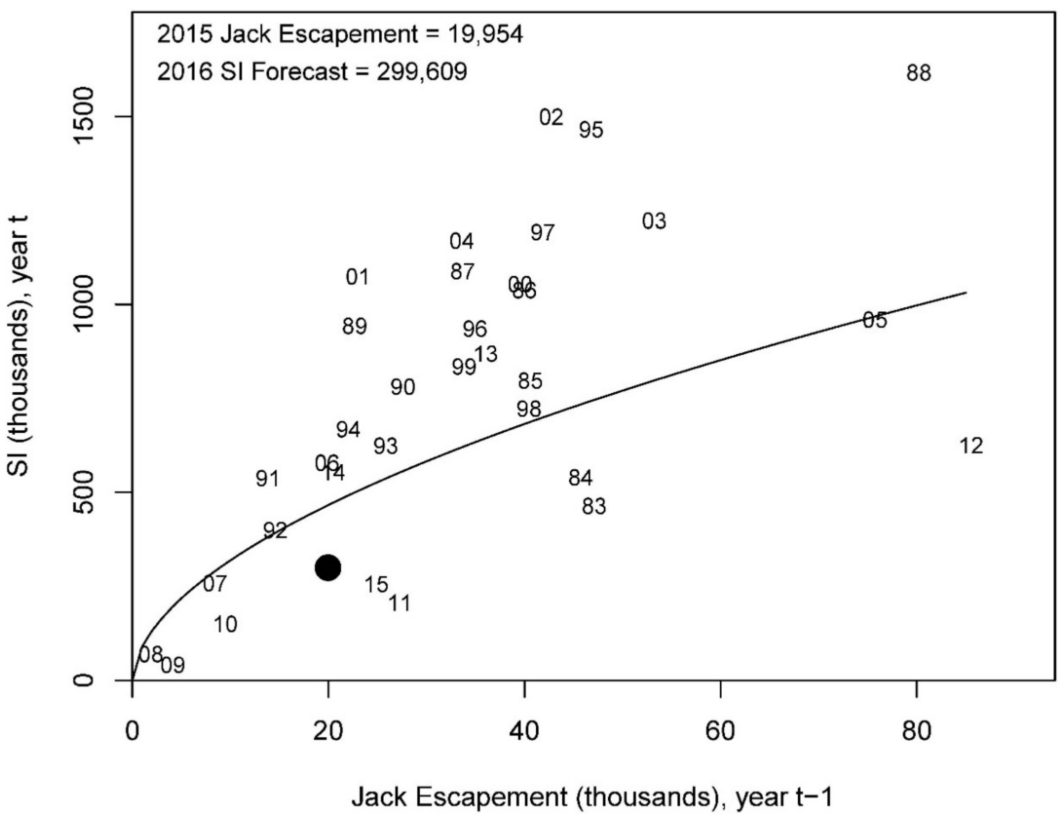

FIGURE II-2. Sacramento Index (SI) forecast based on log-log regression of the SI on jack escapement from the previous year, accounting for autocorrelated errors. The solid line represents the fitted model and the black dot denotes the SI forecast. Years shown are SI years.

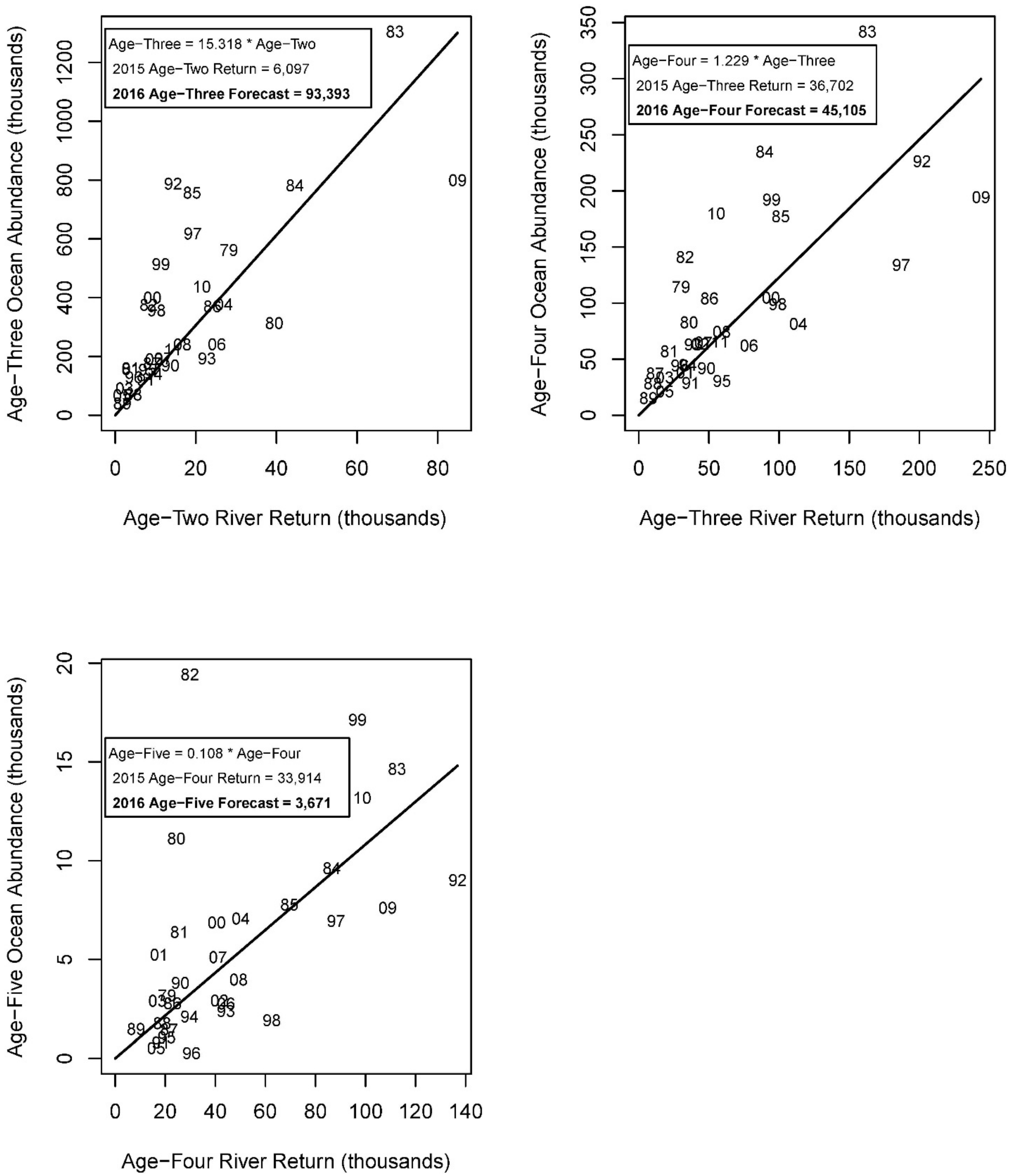

FIGURE II-3. Regression estimators for Klamath River fall Chinook ocean abundance (September 1) based on that year's river return of same cohort. Numbers in plots denote brood years.

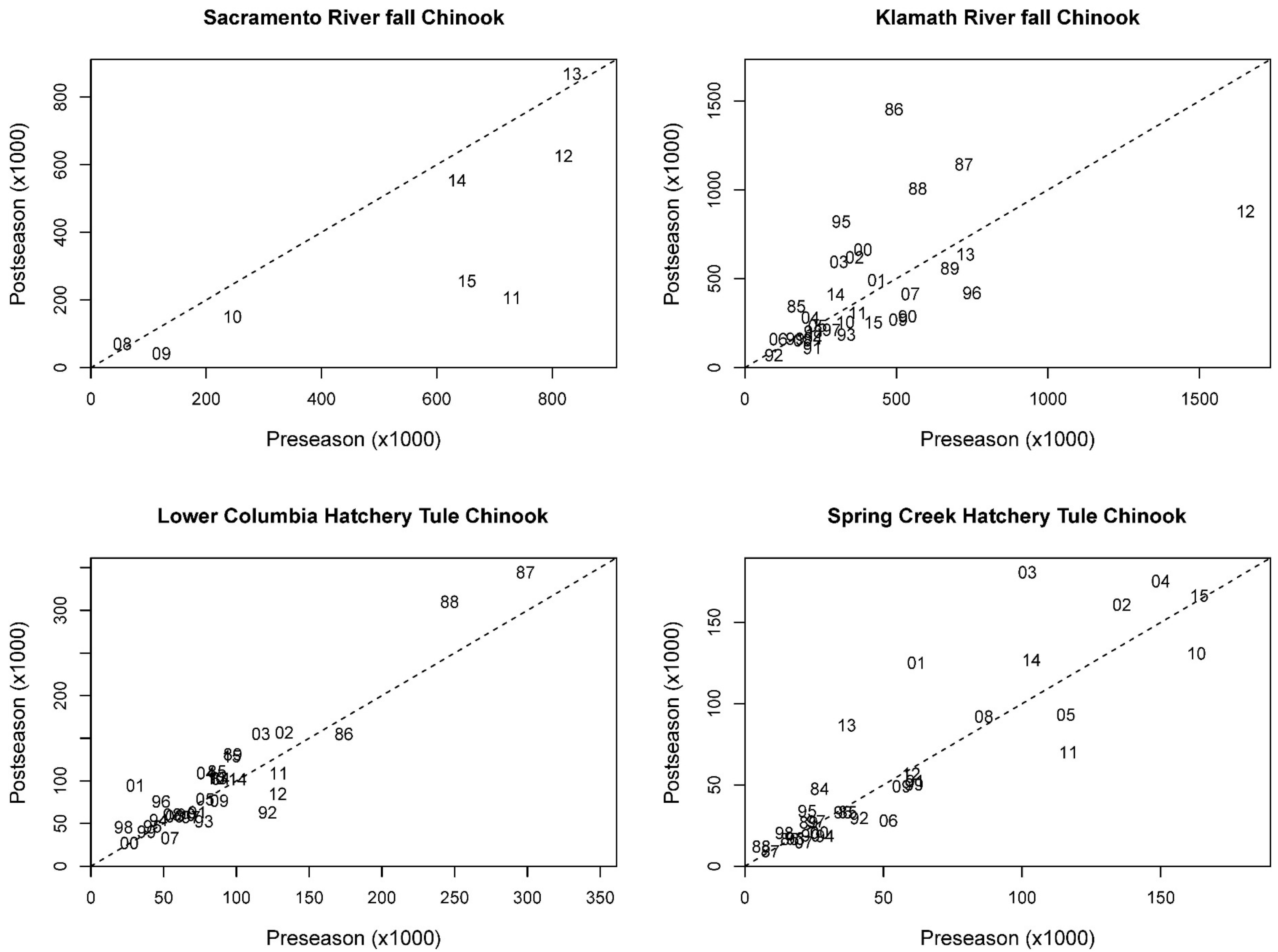

FIGURE II-4. Selected preseason vs. postseason forecasts for Chinook stocks with substantial contribution to Council area fisheries.

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CHAPTER III - COHO SALMON ASSESMENT

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 2016 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 restrictive 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 2015 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 2016 partition was based on the proportion of the smolt releases in 2015.

For the 2016 abundance forecast, the database includes 1970-2015 recruits and 1969-2014 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)])

Where:

a	=	18.35
b	=	25.56
adjusted r^2	=	0.97

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 2015 preseason abundance prediction of 808,400 OPIH coho was 3.21 times higher than the preliminary postseason estimate of 251,700 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 2016 is 396,500 coho, 49 percent of the 2015 prediction and 1.58 times higher than the preliminary 2015 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.

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

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 GAM predictor used for the 2016 forecast was:

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)	168,449	0.67	0.59
PDO	Multivariate ENSO Index (Oct-Dec; t-1)	Upwelling (July-Sept; t-1)	110,632	0.67	0.57
PDO	Spring Transition (Julian date; t-1)	Multivariate ENSO Index (Oct-Dec; t-1)	120,618	0.67	0.59
PDO	Upwelling (July-Sept; t-1)	Sea Surface Temperature (May-Jul; t-1)	185,350	0.65	0.55
PDO	Sea Surface Height (Apr-June; t-1)	Upwelling (July-Sept; t-1)	147,842	0.70	0.59
PDO	Upwelling (Sept-Nov; t-1)	Sea Surface Temperature (Jan; t)	105,940	0.67	0.55
Ensemble Mean (90% prediction intervals)			136,700 (60,830-306,390)	0.71	0.62

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). Production from these systems has declined substantially from the levels observed during 1950-1973, but has steadily increased in recent years. 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 2016, OPITT chose to use the most recent three-year average adult stock abundance, which predicts 16,000 coho.

Predictor Performance

Recent year OCN preseason abundance predictions are compared to postseason estimates in Table III-1. The 2015 preseason abundance prediction of 206,600 OCN coho was 2.93 times higher than the preliminary postseason estimate of 70,400 coho.

Stock Forecasts and Status

The 2016 preseason prediction for OCN (river and lake systems combined) is 152,700 coho, 74 percent of the 2015 preseason prediction and 2.17 times higher than the 2015 postseason estimate (Table III-1). The 2016 preseason prediction for OCNR and OCNL components are 136,700 and 16,000 coho, respectively.

Based on parent escapement levels and observed OPI smolt-to-jack survival for 2013 brood OPI smolts, the total allowable OCN coho exploitation rate for 2016 fisheries is no greater than 20.0 percent under the Salmon FMP (Amendment 13) and no greater than 20.0 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 6.2 percent allows for a total allowable exploitation rate for 2016 fisheries that is no greater than 20.0 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. ACLs are undefined in the FMP for ESA-listed stocks like LCN coho, and are deferred to ESA consultation standards.

Predictor Description

The 2016 prediction for the Clackamas River is based on a 3-cohort average (i.e. 2007, 2010, and 2013). The Clackamas ocean abundance forecast for 2016 is 3,100. The forecast for other Oregon lower Columbia natural (LCN) populations, including the Sandy River, are also the 3-cohort average of recent year abundances based on spawning ground counts. The 2016 LCN coho abundance forecast for all Oregon areas combined is 7,400 coho.

The 2016 predictions for the Washington LCN coho populations are derived by combining estimates of the 2013 brood year natural smolt production based on watershed area and the marine survival rate of 4.1 percent. The 2016 adult abundance forecast for Washington LCN coho is 32,600 coho.

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 2015 preseason abundance prediction of 35,900 LCN coho was 2.01 times higher than the preliminary postseason estimate of 17,900 coho.

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[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 2016 prediction for LCN coho is 40,000 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 in recent years has been based on the allowable marine exploitation rate in a matrix developed by ODFW, similar to the OCN matrix. This was based on parent escapement levels in the Sandy and Clackamas and observed OPI smolt-to-jack survival rates. In November 2014, the Council approved a new LCN matrix based on parent escapement levels for ten populations and the observed Columbia River OPI smolt-to-jack survival rate. Based on this methodology, the total allowable marine and mainstem Columbia River exploitation rate for LCN coho in 2016 fisheries would be no more than 18.0 percent.

Oregon Production Index Area Summary of 2015 Stock Forecasts

The 2016 combined OPI area stock abundance is predicted to be 549,200 coho, which is 54 percent of the 2015 preseason prediction of 1,015,000 coho and 1.70 times higher than the 2015 preliminary postseason estimate of 322,100 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 are exceptions 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 hatchery forecast is based on a marine survival rate of 1.3 percent calculated from a regression using PDO (May-Sep) applied to the 2013 brood year smolts. The natural forecast is based on a marine survival rate of 1.77 percent that was calculated using an average of two regressions: one using a regression of wild run-size to minimum PDO (May-Sep) for Bingham Creek and one using minimum PDO (Jan-June) for Queets River. The estimated marine survival rate of 1.77 percent was then applied to the estimated natural smolt production for terminal runsize. That was then expanded to ocean-age 3 using SUS pre-terminal recoveries of coded wire tagged coho for return years 2004-13.

Predictor Performance

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

Stock Forecasts and Status

The 2016 Willapa Bay hatchery coho abundance forecast is 28,093 ocean abundance compared to a 2015 preseason forecast of 57,693. The 2016 natural coho forecast is 39,516 ocean abundance, compared to a 2015 preseason forecast of 42,884.

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 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 $S_{OFL} = 39{,}516 \times (1-0.74) = 10{,}274$. 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 $S_{ABC} = 39{,}516 \times (1-0.70) = 11{,}854$, 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 Humptulips and South Bay tributary smolt production estimate was based on a mid-point between Clearwater River 2016 smolt density estimate (smolts per square mile) and Chehalis River (Zimmerman) estimate multiplied by basin square miles, then multiplied by a marine survival (mid-point between Queets and Chehalis survival rates). The ocean abundance forecast for natural-origin Humptulips River coho is 3,600 and 1,400 for Grays Harbor South Bay tributary.

The Chehalis and Humptulips river hatchery-origin forecasts were based on a logistic regression of adults per hatchery smolt with the survival rate adjusted by environmental variables (PDO). The ocean abundance forecast for Chehalis was 13,100 and 7,300 for Humptulips. The ocean abundance forecast of 2,500 for net-pens and off-site hatchery programs were based on mean survival rates times releases,

The Chehalis River natural coho forecast methodology had not been agreed to by the comanagers at the time of print.

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 (Table III-3, Figure III-1).

Stock Forecasts and Status

The abundance forecast for Grays Harbor natural stock coho for 2016 is unavailable at time of print.

The forecast for hatchery stock ocean abundance is 22,896 ocean age-3 recruits.

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} = ocean abundance × (1-0.65). The preseason S_{OFL} value cannot be calculated in the absence of a stock forecast and will be calculated when a forecast becomes available. The preseason S_{OFL} will also be recalculated with postseason abundance estimates (when available) to assess OFL compliance.

Quinault River

Predictor Description

The hatchery forecast was based an observation about the 2016 Queets wild coho forecast PDO explanatory parameter value. The average of the recent three lowest hatchery smolt survival rates for the return years 2006, 2010 and 2012 of 2.97 percent was applied to the smolt released from the Quinault National Fish Hatchery.

The natural forecast was based on the four year average ocean age 3 recruits for the years 2006, 2007, 2008 and 2012. They represent the four lowest levels of recruits in the past ten years. The PDO explanatory parameter used for the 2016 Queets wild coho forecast was the highest in recent years with the 1991 smolt and 1992 adult return years.

Predictor Performance

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

Stock Forecasts and Status

The 2016 forecast for Quinault natural coho is 17,100 age-3 ocean recruits, a decrease from the 2015 forecast of 44,187.

The Quinault hatchery coho forecast is 19,821 age-3 ocean recruits that are 100 percent marked.

Queets River

Predictor Description

The natural coho forecast represents the estimated smolt production (155,936) multiplied by an expected survival rate of 2.76 percent to January age-3. The survival rate estimate is based on a model developed by Quinault Fisheries Department.

The hatchery forecast is based on the smolt releases from 2013 (580,794) multiplied by a ten-year average (2005-2014) marine survival rate of 0.95 percent.

Approximately 85 percent of the fish released from the Salmon River facility were marked with an adipose fin clip.

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 2014 forecast was higher than the postseason estimate (Table III-3; Figure III-1).

Stock Forecasts and Status

The 2016 Queets natural coho forecast is 3,495 ocean age 3 recruits, a decrease compared to the 2015 forecast level of 7,518. This ocean abundance results in classification of this stock's status as "low" under the 2002 PST Southern Coho Management Plan (Table III-5).

The 2016 Queets hatchery (Salmon River) coho forecast is 4,494 ocean recruits, a decrease compared to the 2015 forecast of 24,865.

OFL

The OFL is defined in terms of spawner escapement (S_{OFL}). For Queets River coho, MFMT = 0.65, and the OFL is $S_{OFL} = 3{,}495 \times (1\text{-}0.65) = 1{,}223$. 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 to the Queets River produced an extremely low smolt/square mile (231). To estimate Hoh River production we adjusted the Clearwater long term mean production by the proportion the Queets estimate is of its long term mean production (495*(398.8/640)= 308.4 smolts per square mile) and then multiplied by the size of the Hoh watershed (299 square miles), for a total of 92,226 smolts. The total natural smolt production estimate was then multiplied by an expected marine survival rate of 2.76 percent. This is the survival rate forecasted by the Quinault Fisheries Department for wild Queets coho, and is consistent with Strait Juan de Fuca survival estimate for wild coho stocks at 2.36 percent and the mean of Mara Zimmerman's 2 models developed from Satsop River data at 2.96 percent. Both of these estimates are generated from databases of smolt output and subsequent recruits and use correlations with environmental indicators. The Strait estimate also includes an indicator of jack returns to the Lower Elwha hatchery.

The 2.76 percent estimate seems to be a reasonable estimator for the Hoh system wild coho, and when coupled with an average freshwater production, yields a runsize forecast that is comparable to last year's actual return.

No hatchery production is projected for the Hoh system for 2016.

Predictor Performance

A comparison of preseason ocean age-3 forecasts with postseason estimates derived from FRAM run reconstruction indicated a tendency to under-predict actual run-size (Table III-3; Figure III-1).

Stock Forecasts and Status

The 2016 Hoh River natural coho forecast is 2,066 ocean age 3 recruits, a decrease compared to the 2015 forecast of 5,125. This ocean abundance results in classification of this stock's status as "low" under the 2002 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 = 0.61, and the OFL is $S_{OFL} = 2{,}066 \times (1\text{-}0.65) = 723$. 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

Average smolt production for the Quillayute system during the years it was trapped is estimated at 305,601 smolts. To the south, smolt production is estimated annually in the Queets system by the Quinault Fisheries Department, the Queets production relative to its average production is used to adjust the Quillayute production up or down to estimate smolt production in the Quillayute system. This is done in two steps: first adjust the Quillayute mean estimate to an equivalent long term mean by comparing the Clearwater long term mean to the mean during the years ('87, '88, '90, '92-'94) when portions of the Quillayute River system were trapped. (69,294/62,167) x 305,601=340,491 long term average Quillayute smolt production. Next adjust this long term Quillayute mean by the current Queets production compared to its long term average (123,639/198,422) x 340,491. The total production for the system is estimated at 212,164 wild smolts. Separating these into summer and fall coho smolts by the relative number of spawners in brood year 2013 yields estimates of 12,734 wild summer coho smolts and 199,430 wild fall coho smolts. Wild summer coho spawning has been documented to be temporally and spatially isolated from spawning wild fall coho.

Summer Coho

The summer natural coho forecast is based on the estimated total summer coho smolt production (12,734) and a projected ocean survival rate of 2.76 percent. This is a lower ocean survival rate than the 4.0 percent used in 2015.

An examination of the return rates of both hatchery releases and natural smolts indicates that hatchery return rates are 1.5 percent below natural returns. Thus, for the hatchery component, an ocean survival rate of 1.76 percent was selected. The survival rate of 1.76 percent was multiplied by a release of 95,728 smolts.

Fall Coho

The forecast for the natural component was based on the estimated total fall coho smolt production (199,430) multiplied by an expected marine survival rate of 2.76 percent, which was the same as used for the summer natural returns.

The fall hatchery production forecast was based on the same prediction of marine survival (1.76 percent) used for the summer hatchery coho forecast, multiplied by a release of 451,040 smolts.

Predictor Performance

A comparison of preseason ocean age-3 forecasts with postseason estimates for fall natural coho derived from FRAM run reconstruction indicated no notable bias (Table III-3; Figure III-1).

Stock Forecasts and Status

The 2016 Quillayute River summer natural and hatchery coho forecasts are 285 and 1,368 ocean recruits, respectively. Approximately 92.2 percent of the hatchery smolts were marked with an adipose fin clip. The 2016 forecast abundances of natural and hatchery summer coho are lower than the 2015 forecasts.

The 2016 Quillayute River fall natural and hatchery coho forecasts are 4,469 and 6,445 ocean recruits, respectively. The 2016 forecast abundance of natural Quillayute fall coho and the hatchery forecast are lower than their respective 2015 forecasts. The hatchery smolts were marked as follows: 276,395 with adipose fin-clip only; 75,551 with adipose fin-clip and CWT; 80,813 with CWT only, and 18,281 without adipose fin-clip or CWT.

The ocean abundance forecast for Quillayute fall natural coho results in classification of the stock abundance as "low" under the 2002 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 2016 forecast of natural coho production for these independent streams is based on a prediction of 350 smolts per square mile of watershed drainage, 424 square miles of watershed, resulting in 148,400 smolts multiplied by an expected marine survival rate of 1.3 percent. This rate was the average of the jack-based and the PDO models.

The hatchery forecast is based on two linear regression models using the natural log of the brood year jack return to the Makah National Fish Hatchery and the North Pacific Gyre Oscillation index for January through March as predictors. The predicted marine survival of 1.23 percent for the brood year 2013 was multiplied by brood year smolt release (255,432) from the Makah National Fish Hatchery.

Predictor Performance

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

Stock Forecasts and Status

The 2016 forecast of natural coho production for these independent streams is 1,924 age-3 ocean recruits. The hatchery forecast is 2,541 age-3 ocean recruits, and 100 percent of the 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 (OA3) 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 2013 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 2016 total hatchery and natural coho ocean recruit forecast for the Puget Sound region is 255,945, compared to a 2015 forecast of 891,900. The hatchery coho forecast is 164,970 compared to the 2015 forecast of 423,900, and the natural coho forecast for 2016 of 90,975 is much lower than the 2015 forecast of 467,900.

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 are exceptions 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

As in past years, the natural and hatchery coho forecasts include both Eastern and Western Strait of Juan de Fuca drainages. This year, a new method was used to directly predict the OA3 abundance of the JDF natural stock. This forecast is based upon the relationships between historic OA3 stock abundance and North Pacific Gyre Oscillation (NPGO) May – September ocean variable.

The hatchery forecasts were based on applying hatchery-specific marine survival rate predictions to the 2012 BY smolt releases for each hatchery. The marine survival rate predictions for the hatchery stocks were based on averages of estimated return rates of adults.

Predictor Performance

A comparison of preseason ocean age-3 forecasts with postseason estimates derived from FRAM run reconstruction indicated a tendency to under-predict actual run-size prior to 2013; the 2013 data showed the reverse (Table III-4; Figure III-1b). The 2013 preseason forecast overestimated the postseason estimate by a factor of 1.29.

Stock Forecasts and Status

The 2016 forecasts for Strait of Juan de Fuca natural and hatchery coho age-3 ocean recruits are 4,427 and 3,924, respectively.

The preseason forecast of 4,427 age-3 ocean recruits places Strait of Juan de Fuca natural coho in the Critical abundance-based status category, which 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 2002 PST Southern Coho Management Plan (Table III-5). Under the PST Coho Management Plan, the southern U.S. share of the allowable exploitation rate of 20 percent could be as low as 7 percent, but may increase if Canada adopts fisheries resulting in less that its allowable share. In recent years, when Canada has managed their fisheries to minimize impacts on upper Fraser coho, their exploitation rate on Strait of Juan de Fuca coho has been less than 2.5 percent.

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} = 11,131 × (1-0.60) = 4,452. 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 forecasts are 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 2016 forecasts for Nooksack-Samish natural and hatchery coho ocean abundance age-3 ocean recruits are 8,987 and 28,789 respectively.

Skagit

Predictor Description

The natural coho forecast is the product of measured smolt production from the Skagit basin multiplied by a marine survival rate expectation of 1.34 percent. This natural coho marine survival rate was based upon the NOAA ecosystem indicator data, specifically the ONI January-June, PDO May – September and NPGO May - September.

The hatchery forecasts are based on Marblemount Hatchery CWT recoveries. Brood years 1996 – 2011 produced an average marine survival rate of 1.56 percent; this was multiplied by the total number of smolts released from all regional hatcheries.

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 (Table III-4; Figure III-1b).

Stock Forecasts and Status

The 2016 forecasts for Skagit River natural and hatchery coho ocean recruits are 8,912 and 4,947 respectively.

The preseason forecast of 8,912 age-3 ocean recruits places Skagit natural coho in the Critical abundance based status category, which 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 2002 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 = 0.20 and the OFL is S_{OFL} = 8,912 × (1-0.20) = 7,130. The preseason S_{OFL} value will be recalculated with postseason abundance estimates (when available) to assess OFL compliance.

Stillaguamish

Predictor Description

The natural coho forecast was based on the regression of adult terminal returns on adjusted smolt trap catch per unit effort (CPUE). To capture the variability of marine survival, the CPUE was adjusted with South Fork Skykomish River natural coho marine survival observations. The resulting terminal run-size estimate was then expanded by a pre-terminal Puget Sound exploitation rate.

Predictor Performance

A comparison of preseason ocean age-3 forecasts with postseason estimates derived from FRAM run reconstruction in recent years indicated no persistent tendency to under- or over-predict abundance (Table III-4; Figure III-1b). The 2013 preseason forecast under-predicted the postseason estimate by a factor of 0.37.

Stock Forecasts and Status

The preseason forecast of 2,770 age-3 ocean recruits places Stillaguamish natural coho in the Critical abundance based status category, which 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 2002 PST Southern Coho Management Plan (Table III-5).

OFL

The OFL is defined in terms of spawner escapement (S_{OFL}). For Stillaguamish coho, MFMT = 0.20 and the OFL is S_{OFL} = 2,770 × (1-0.20) = 2,216. The preseason S_{OFL} value will be recalculated with postseason abundance estimates (when available) to assess OFL compliance.

Snohomish

Predictor Description

The natural coho forecast used the estimated 2013 BY smolt production multiplied by a marine survival rate expectation. The hatchery forecasts were based on BY 2013 releases multiplied by a marine survival rate.

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 (Table III-4; Figure III-1b). The 2013 forecast was lower than the postseason estimate by a factor of 0.87.

Stock Forecasts and Status

The 2016 forecast for Snohomish River natural coho ocean recruits is 20,625. The Snohomish regional hatchery coho forecast is 16,740.

The preseason forecast of 20,625 age-3 ocean recruits places Snohomish natural coho in the Critical abundance-based status category, which results in an allowable total exploitation rate of no more than 20 percent under the Council-adopted exploitation rate matrix (Appendix A, Table A-5) and 20 percent with an abundant status under the 2002 PST Southern Coho Management Plan (Table III-5).

OFL

The OFL is defined in terms of spawner escapement (S_{OFL}). For Snohomish coho, MFMT = 0.20 and the OFL is S_{OFL} = 20,626 × (1-0.20) = 16,500. The preseason S_{OFL} value will be recalculated with postseason abundance estimates (when available) to assess OFL compliance.

Hood Canal

Predictor Description

The natural coho 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 2002-2011. The 1999-2001 broods were excluded because of the unusually high recruit-per-tagged jack ratio, which is not expected to occur this year.

The hatchery coho forecasts are based on average cohort reconstruction-based December age-2 recruits/smolt for the six most recent available broods from each facility, applied to the 2013 brood smolt releases for each facility. The December age-2 marine survival rates used for these forecasts were 10.2 percent for George Adams Hatchery, 4.8 percent for Port Gamble Net Pens, 12.1 percent for the Quilcene National Fish Hatchery, and 2.0 percent for the Quilcene Bay Net Pens.

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 in recent years. The 2013 forecast was slightly lower than the postseason estimate by a factor of 0.97 (Table III-4; Figure III-1b).

Stock Forecasts and Status

Converted to ocean age-3 forecasts, the Hood Canal region natural and hatchery coho ocean recruits are 35,322 and 83,465, respectively.

The preseason forecast of 35,322 age-3 ocean recruits places Hood Canal natural coho in the Low abundance based status category, which 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 2002 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 = 0.45, and the OFL is S_{OFL} = 35,322 × (1-0.45) = 19,427. The preseason S_{OFL} value will be recalculated with postseason abundance estimates (when available) to assess OFL compliance.

South Sound

Predictor Description

The natural coho 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 2.53 percent was based upon a 5-year average return rate of

Lake Washington natural smolts. The deep South Sound stocks' marine survival prediction of 6.80 percent came from a different year's average for Lake Washington natural smolts.

Almost all the hatchery coho forecasts used an average from either Soos Creek Hatchery (4.8 percent) for the years 2008-2010 or Peale Pass net pens (2.20 percent) for the years 2009-2010.

Stock Forecasts and Status

The 2016 preseason forecast of age-3 ocean recruits for South Sound region natural and hatchery coho are 9,932 and 27,105 respectively.

STOCK STATUS DETERMINATION UPDATES

No stocks were classified as overfished, or met the criteria for approaching an overfished condition in 2016 (Table V-4). Status determination criteria for Willapa Bay coho have been identified. The MSST is 8,600 and the MFMT is 74 percent. The Annual Catch Limit is 71 percent and the Conservation Objective is 17,200 natural area spawners.

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 slightly higher than 2015 projections. Table III-6 summarizes projected 2016 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 3)

Stock	Year	Preseason	Postseason[a]	Preseason/Postseason[a]
Oregon Production Index Area Hatchery Total[b]	1996	309.2	182.6	1.69
	1997	376.1	215.3	1.75
	1998	118.4	203.6	0.58
	1999	559.2	319.6	1.75
	2000	671.4	677.1	0.99
	2001	1,707.6	1,454.2	1.17
	2002	361.7	660.1	0.55
	2003	863.1	952.5	0.91
	2004	623.9	634.6	0.98
	2005	389.9	443.1	0.88
	2006	398.8	440.6	0.91
	2007	593.6	476.5	1.25
	2008	216.1	565.4	0.38
	2009	1,073.1	1,066.2	1.01
	2010	408.0	551.3	0.74
	2011	375.1	442.3	0.85
	2012	341.7	182.3	1.87
	2013	525.4	316.9	1.66
	2014	983.1	1,263.6	0.78
	2015	808.4	251.7	3.21
	2016	396.5	-	-
Columbia River Early	1996	142.2	98.0	1.45
	1997	206.9	129.8	1.59
	1998	63.8	126.4	0.50
	1999	325.5	174.9	1.86
	2000	326.3	378.0	0.86
	2001	1,036.5	873.0	1.19
	2002	161.6	324.7	0.50
	2003	440.0	645.7	0.68
	2004	313.6	389.0	0.81
	2005	284.6	282.7	1.01
	2006	245.8	251.4	0.98
	2007	424.9	291.0	1.46
	2008	110.3	333.9	0.33
	2009	672.7	681.4	0.99
	2010	245.3	274.3	0.89
	2011	216.0	288.5	0.75
	2012	229.8	114.7	2.00
	2013	331.6	190.8	1.74
	2014	526.6	760.5	0.69
	2015	515.2	150.5	3.42
	2016	153.7	-	-
Columbia River Late	1996	114.4	30.8	3.71
	1997	86.5	53.7	1.61
	1998	24.9	47.3	0.53
	1999	140.9	120.7	1.17
	2000	278.0	260.1	1.07
	2001	491.8	488.3	1.01
	2002	143.5	271.8	0.53
	2003	377.9	248.0	1.52
	2004	274.7	203.0	1.35
	2005	78.0	111.6	0.70
	2006	113.8	156.3	0.73
	2007	139.5	171.0	0.82
	2008	86.4	207.6	0.42
	2009	369.7	374.1	0.99
	2010	144.2	263.6	0.55
	2011	146.5	141.2	1.04
	2012	87.4	55.6	1.57
	2013	169.5	110.7	1.53
	2014	437.5	480.3	0.91
	2015	261.9	91.8	2.85
	2016	226.9	-	-

TABLE III-1. Preliminary preseason and postseason coho stock abundance estimates for Oregon production index area stocks in thousands of fish. (Page 2 of 3)

Stock	Year	Preseason	Postseason[a/]	Preseason/Postseason[a/]
Oregon Coast North of Cape Blanco	1996	38.5	28.0	1.38
	1997	60.4	19.0	3.18
	1998	21.6	19.7	1.10
	1999	59.4	14.4	4.13
	2000	48.5	23.4	2.07
	2001	127.3	46.9	2.71
	2002	36.6	41.6	0.88
	2003	29.3	34.5	0.85
	2004	16.6	21.7	0.76
	2005	11.5	10.7	1.07
	2006	8.6	7.9	1.09
	2007	7.0	1.3	5.38
	2008	1.7	7.1	0.24
	2009	7.3	7.5	0.97
	2010	4.4	8.6	0.51
	2011	3.6	3.6	1.00
	2012	6.4	3.1	2.06
	2013	5.6	5.7	0.98
	2014	4.8	19.8	0.24
	2015	6.9	5.6	1.23
	2016	5.5	-	-
California and Oregon Coast South of Cape Blanco	1996	14.2	25.8	0.55
	1997	22.3	12.8	1.74
	1998	8.1	10.2	0.79
	1999	33.4	9.6	3.48
	2000	18.6	15.6	1.19
	2001	52.0	46.0	1.13
	2002	20.0	22.0	0.91
	2003	15.9	24.3	0.65
	2004	19.0	29.9	0.64
	2005	15.8	38.1	0.41
	2006	30.6	25.0	1.22
	2007	22.2	13.2	1.68
	2008	17.7	16.8	1.05
	2009	23.4	3.1	7.55
	2010	14.1	4.8	2.94
	2011	9.0	9.0	1.00
	2012	18.1	8.6	2.10
	2013	18.7	7.6	2.46
	2014	14.2	3.4	4.18
	2015	24.4	3.8	6.42
	2016	10.4	-	-
Lower Columbia River Natural	2007	21.5	19.4	1.11
	2008	13.4	27.2	0.49
	2009	32.7	40.4	0.81
	2010	15.1	30.8	0.49
	2011	22.7	23.4	0.97
	2012	30.1	12.9	2.33
	2013	46.5	17.8	2.61
	2014	33.4	64.0	0.52
	2015	35.9	17.9	2.01
	2016	40.0	-	-

TABLE III-1. Preliminary preseason and postseason coho stock abundance estimates for Oregon production index area stocks in thousands of fish. (Page 3 of 3)

Stock	Year	Preseason	Postseason[a/]	Preseason/Postseason[a/]
Oregon Coast Natural	1996	63.2	86.1	0.73
(Rivers and Lakes)	1997	86.4	27.8	3.11
	1998	47.2	29.2	1.62
	1999	60.7	51.9	1.17
	2000	55.9	69.0	0.81
	2001	50.1	163.2	0.31
	2002	71.8	304.5	0.24
	2003	117.9	278.8	0.42
	2004	150.9	197.0	0.77
	2005	152.0	150.1	1.01
	2006	60.8	116.4	0.52
	2007	255.4	60.0	4.26
	2008	60.0	170.9	0.35
	2009	211.6	257.0	0.82
	2010	148.0	266.8	0.55
	2011	249.4	311.6	0.80
	2012	291.0	123.8	2.35
	2013	191.0	128.4	1.49
	2014	230.6	403.3	0.57
	2015	206.6	70.4	2.93
	2016	152.7	-	-
Salmon Trout Enhancement Program[c/]	1996	0.4	1.2	0.33
	1997	1.3	0.3	4.33
	1998	0.2	0.3	0.67
	1999	0.7	0.4	1.75
	2000	0.6	0.5	1.20
	2001	1.0	1.4	0.71
	2002	0.6	3.0	0.20
	2003	3.6	3.6	1.00
	2004	3.1	1.0	3.10
	2005	1.0	0.4	2.50
	2006	0.6	0.1	6.00
	2007	0.2	0.0	-

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

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/] Troll	Ocean Fisheries[b/] Sport	Oregon and California Coastal Returns: Hatcheries and Freshwater Harvest[c/]	Oregon and California Coastal Returns: OCN Spawners[d/]	Oregon and California Coastal Returns: Private Hatcheries	Columbia River Returns	Abundance[e/]	Ocean Exploitation Rate Based on OPI Abundance[f/]
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	638.9	320.6	79.3	70.0	332.0	1578.1	3,195.4	0.34
1987	468.2	296.2	45.1	30.1	453.7	324.2	1,272.4	0.93
1988	844.7	297.2	61.1	56.8	119.3	686.1	1,918.9	0.63
1989	645.1	425.5	61.1	46.4	116.1	728.7	2,176.5	0.52
1990	275.9	357.1	28.7	22.5	46.9	208.0	987.4	0.67
1991	448.4	469.9	77.8	38.1	35.6	981.5	2,040.4	0.46
1992	67.4	256.5	51.0	44.2	-	225.4	629.6	0.51
1993	13.1	140.8	38.6	56.1	-	117.9	315.9	0.49
1994	2.7	3.0	28.2	48.5	-	173.4	267.5	0.02
1995	5.4	43.5	37.5	57.3	-	77.4	204.1	0.24
1996	7.0	31.8	45.7	79.3	-	117.1	260.3	0.15
1997	5.5	22.4	26.9	31.6	-	156.4	230.5	0.12
1998	3.5	12.8	29.4	34.3	-	175.9	270.8	0.06
1999	3.6	36.5	22.6	51.2	-	289.1	432.0	0.09
2000	25.2	74.6	33.2	81.1	-	558.3	762.4	0.13
2001	38.1	216.8	75.8	185.2	-	1128.3	1,673.2	0.15
2002	15.0	118.7	54.0	269.0	-	535.8	972.2	0.14
2003	28.8	252.4	45.1	235.3	-	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	42.8	164.6	-	354.7	629.9	0.11
2006	4.5	47.5	29.6	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	15.9	180.1	-	520.8	769.8	0.04
2009	27.7	201.2	16.6	265.3	-	760.2	1,341.3	0.17
2010	5.8	48.8	19.5	287.1	-	471.3	848.4	0.06
2011	4.2	54.7	20.0	360.8	-	376.5	836.4	0.07
2012	4.7	45.5	18.5	104.6	-	143.9	311.3	0.16
2013	8.4	48.3	26.5	135.3	-	241.0	473.6	0.12
2014	35.6	197.4	42.2	362.0	-	970.0	1,696.8	0.14
2015[g/]	11.7	84.4	11.1	61.1	-	171.4	332.7	0.29

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

b/ Incl. est. nonretention mort.: 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 escapements for selected Washington coastal adult natural coho stocks in thousands of fish.

Year	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/]		
1986	11.6	36.3	0.32	4.1	18.1	0.23	9.8	24.6	0.40	93.8	123.3	0.76
1987	27.3	33.8	0.81	13.0	14.2	0.91	20.6	15.9	1.29	218.6	66.3	3.30
1988	23.0	13.5	1.70	4.4	19.4	0.23	10.3	17.9	0.57	55.7	96.8	0.58
1989	28.2	18.8	1.50	11.0	9.2	1.19	13.6	12.0	1.13	82.3	156.5	0.53
1990	45.5	11.7	3.91	8.1	8.7	0.93	13.6	27.3	0.50	81.2	96.1	0.84
1991	16.3	26.4	0.62	6.3	11.6	0.55	16.1	26.6	0.60	244.6	139.1	1.76
1992	22.8	15.8	1.44	8.9	15.4	0.58	11.7	17.7	0.66	60.4	58.0	1.04
1993	13.2	10.5	1.26	8.3	3.4	2.47	12.9	12.7	1.01	144-153	58.5	2.46-2.62
1994	11.6	8.4	1.38	5.0	2.2	2.31	6.9	2.5	2.78	53.8-60.2	14.0	3.84-4.30
1995	13.1	19.8	0.66	6.8	9.7	0.70	12.1	10.7	1.13	103.4	70.2	1.47
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	16.4	1.34	7.6	10.9	0.70	21.8	16.5	1.32	67.9	126.1	0.54
2011	28.2	12.8	2.20	11.6	12.1	0.96	13.3	11.9	1.12	89.1	100.9	0.88
2012	33.5	12.4	2.70	14.3	5.7	2.51	37.2	8.1	4.59	150.2	104.0	1.44
2013	17.2	15.7	1.10	8.6	8.6	1.00	24.5	9.2	2.66	196.8	78.8	2.50
2014	18.4	20.5	0.90	8.9	11.1	0.80	10.3	11.6	0.89	108.8	196.4	0.55
2015	10.5	NA	NA	5.1	NA	NA	7.5	NA	NA	142.6	NA	NA
2016	4.5	-	-	2.1	-	-	3.5	-	-	NA	-	-

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

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

Year	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**	
1986	NA	332.1	-	NA	76.8	-	110.8	197.9	0.56
1987	NA	261.1	-	NA	46.3	-	96.5	71.7	1.35
1988	NA	202.9	-	NA	35.4	-	39.6	15.5	2.55
1989	NA	220.0	-	NA	13.5	-	77.4	25.5	3.04
1990	NA	87.2	-	75.8	34.1	2.22	94.2	14.2	6.63
1991	NA	81.4	-	71.5	11.3	6.33	38.1	15.3	2.49
1992	NA	64.6	-	42.4	18.0	2.36	23.2	19.9	1.17
1993	NA	69.6	-	61.8	10.6	5.83	89.6	16.7	5.37
1994	NA	108.2	-	21.9	30.3	0.72	25.4	57.0	0.45
1995	NA	86.4	-	70.3	20.4	3.45	36.4	41.1	0.89
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	62.0	1.55	25.9	16.6	1.56	33.2	13.3	2.50
2011	138.1	68.6	2.01	66.6	63.2	1.05	74.7	58.2	1.28
2012	48.3	142.6	0.34	47.5	63.7	0.75	73.4	84.5	0.87
2013	137.2	150.8	0.91	33.1	89.9	0.37	36.8	37.8	0.97
2014	112.4	54.1	2.08	32.5	59.7	0.54	82.8	77.4	1.07
2015	121.4	NA	NA	31.3	NA	NA	61.5	NA	NA
2016	8.9	-	-	2.8	-	-	35.3	-	-

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

Year	Preseason Forecast	Postseason Return	Pre/Postseason	Preseason Forecast	Postseason Return	Pre/Postseason
		Snohomish			Strait of Juan de Fuca	
1986	NA	293.0	-	24.7	50.6	0.49
1987	NA	46.3	-	17.8	24.4	0.73
1988	NA	35.4	-	19.5	26.3	0.74
1989	NA	13.5	-	17.0	29.3	0.58
1990	308.8	276.5	1.12	25.8	29.4	0.88
1991	308.8	163.4	1.89	24.1	22.0	1.10
1992	389.7	192.5	2.02	25.7	28.6	0.90
1993	394.4	142.3	2.77	20.8	11.6	1.79
1994	256.7	293.6	0.87	20.8	11.5	1.81
1995	358.3	211.3	1.70	11.4	23.0	0.50
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	53.9	1.84	8.5	19.9	0.43
2011	180.0	141.8	1.27	12.3	18.9	0.65
2012	109.0	190.0	0.57	12.6	13.5	0.93
2013	163.8	188.6	0.87	12.6	9.8	1.29
2014	150.0	81.4	1.84	12.5	15.5	0.81
2015	151.5	NA	NA	11.1	NA	NA
2016	20.6	-	-	4.4	-	-

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	20%	Critical
Stillaguamish	20%	Critical
Snohomish	20%	Critical
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	20%	Low
Stillaguamish	20%	Low
Snohomish	20%	Low
Hood Canal	45%	Moderate
Strait of Juan de Fuca	20%	Low
Quillayute Fall[c/]		Low
Hoh[c/]		Low
Queets[c/]		Low
Grays Harbor		NA

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 2002 PST Southern Coho Management Plan.
c/ Categories (Abundant, Moderate, Low) correspond to the general exploitation rate ranges depicted in paragraph 3(a) of the 2002 PST Southern Coho Management Plan. For Washington Coast stocks, categorical status is determined by taking the midpoint of the range of exploitation rates associated with achieving the escapement goal ranges. The exploitation rate ranges are based on preseason abundance forecasts and the upper and lower ends of the escapement goal ranges. Maximum exploitation rates are computed using the lower end of the escapement range; minimum exploitation rates are computed using the upper end of the escapement range.

TABLE III-6. Projected coho mark rates for 2016 fisheries under base period fishing patterns (percent marked).

Area	Fishery	June	July	August	Sept
Canada					
Johnstone Strait	Recreational	-	32%	31%	-
West Coast Vancouver Island	Recreational	48%	33%	34%	31%
North Georgia Strait	Recreational	47%	47%	46%	40%
South Georgia Strait	Recreational	36%	53%	42%	46%
Juan de Fuca Strait	Recreational	50%	51%	50%	47%
Johnstone Strait	Troll	57%	45%	32%	43%
NW Vancouver Island	Troll	41%	35%	35%	27%
SW Vancouver Island	Troll	52%	47%	48%	50%
Georgia Strait	Troll	57%	55%	55%	48%
Puget Sound					
Strait of Juan de Fuca (Area 5)	Recreational	64%	56%	55%	55%
Strait of Juan de Fuca (Area 6)	Recreational	60%	56%	58%	53%
San Juan Island (Area 7)	Recreational	69%	62%	52%	36%
North Puget Sound (Areas 6 & 7A)	Net	-	54%	55%	38%
Council Area					
Neah Bay (Area 4/4B)	Recreational	57%	60%	55%	63%
LaPush (Area 3)	Recreational	67%	62%	70%	50%
Westport (Area 2)	Recreational	72%	70%	65%	61%
Columbia River (Area 1)	Recreational	77%	76%	69%	72%
Tillamook	Recreational	65%	58%	50%	41%
Newport	Recreational	59%	50%	47%	32%
Coos Bay	Recreational	45%	39%	29%	19%
Brookings	Recreational	38%	24%	21%	13%
Neah Bay (Area 4/4B)	Troll	55%	57%	56%	58%
LaPush (Area 3)	Troll	51%	57%	55%	58%
Westport (Area 2)	Troll	58%	64%	65%	59%
Columbia River (Area 1)	Troll	73%	72%	67%	59%
Tillamook	Troll	59%	56%	56%	51%
Newport	Troll	55%	51%	47%	44%
Coos Bay	Troll	44%	39%	34%	20%
Brookings	Troll	27%	30%	34%	47%
Columbia River					
Buoy 10	Recreational	-	-	-	65%

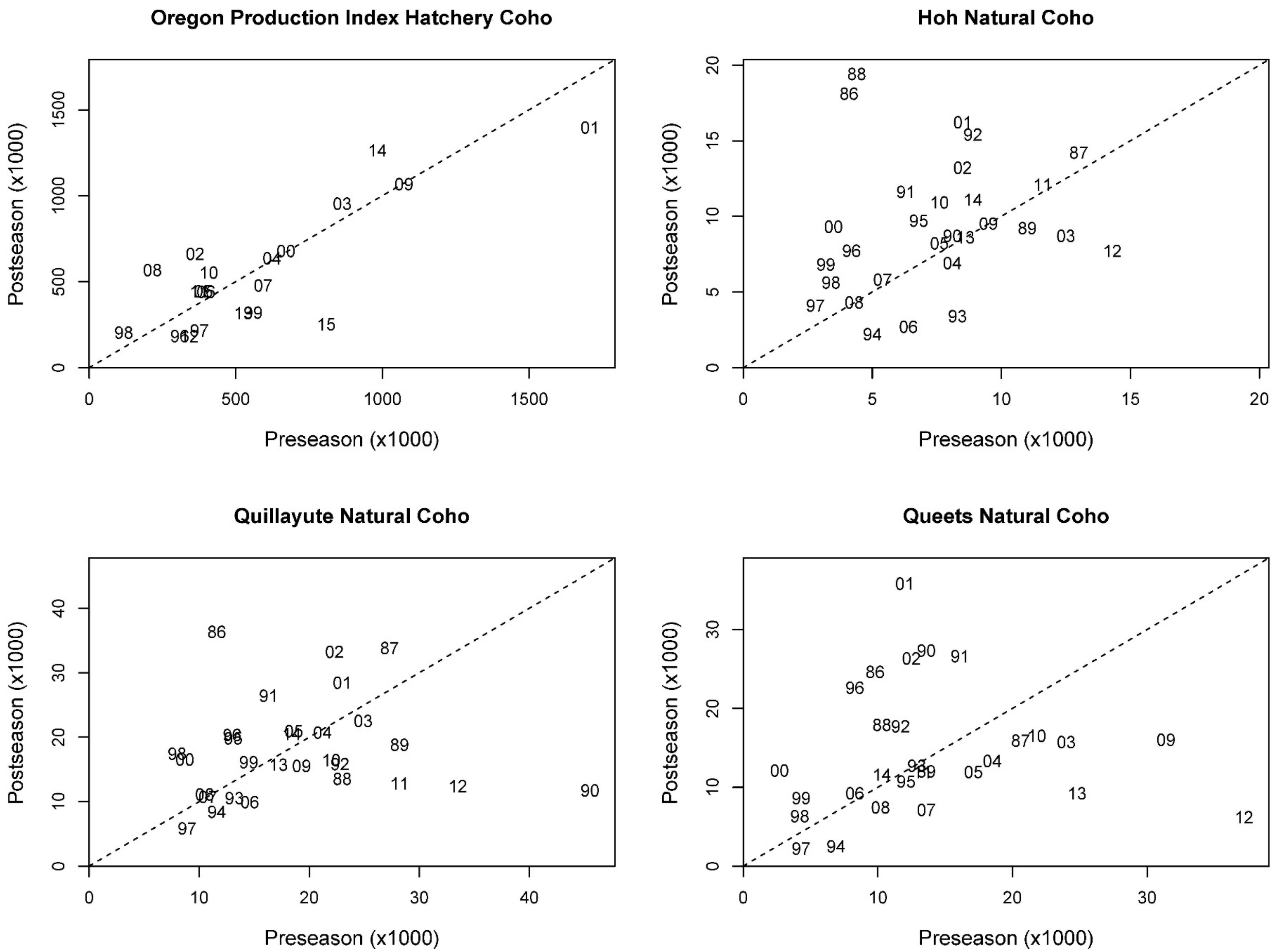

FIGURE III-1a. Selected preseason vs. postseason forecasts for coho stocks with substantial contribution to Council area fisheries.

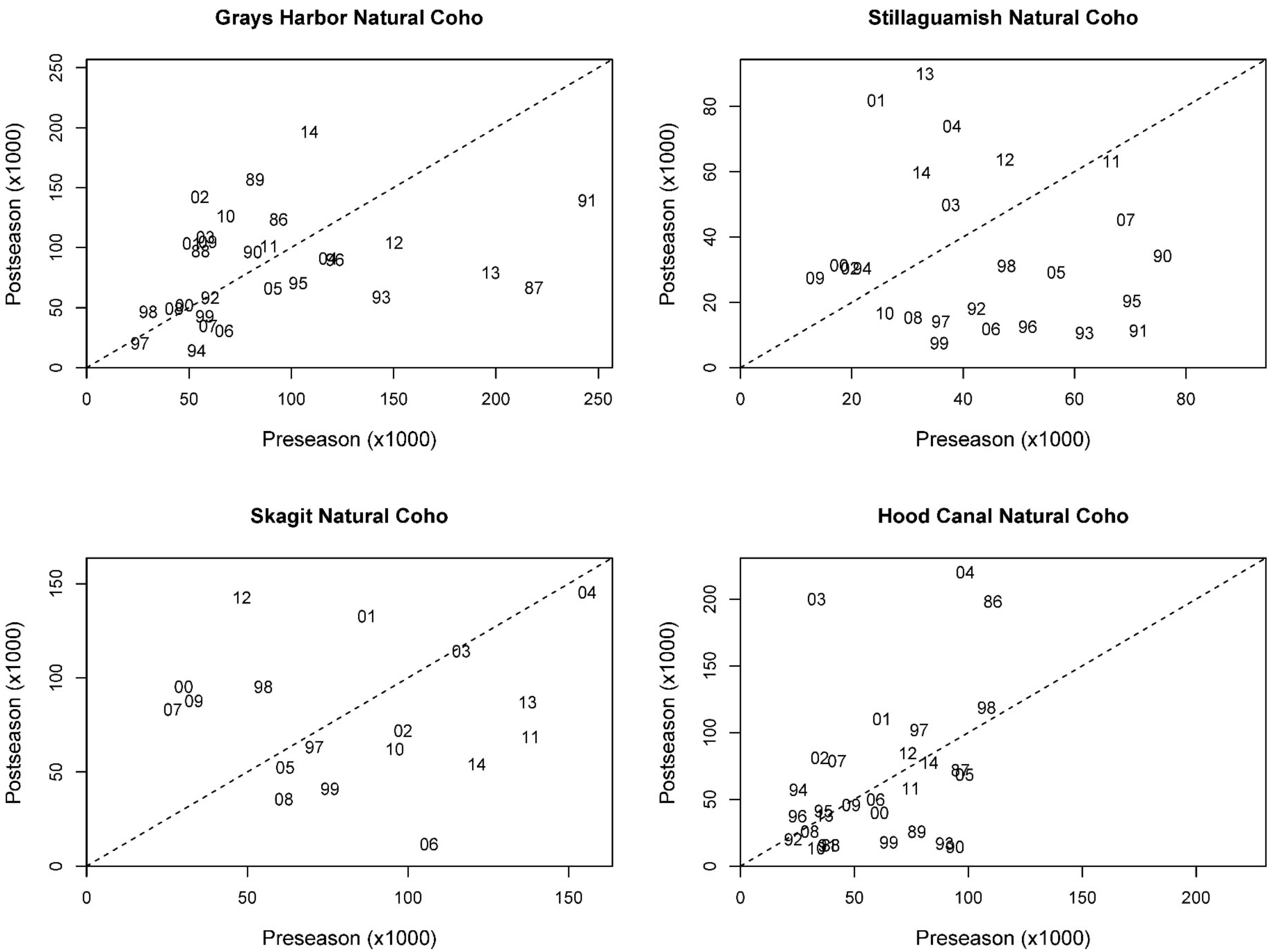

FIGURE III-1b. Selected preseason vs. postseason forecasts for coho stocks with substantial contribution to Council area fisheries.

CHAPTER IV: AFFECTED ENVIRONMENT - PINK SALMON ASSESSMENT

Two major runs comprise the pink salmon population available to Council fisheries during odd-numbered years: the Fraser River (British Columbia) run, which is more abundant, and the Puget Sound run. The 2015 run size forecast for Fraser pinks was 14.50 million fish and the 2015 Puget Sound pink salmon run size forecast was 6.76 million. The actual run sizes for 2015 are not yet available. Because pink salmon are not available to Council fisheries during an even-numbered year, they will not be an important management consideration in 2016.

Table IV-1 provides a summary of recent run sizes and forecasts.

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[b/]	6.76	NA	14.50	NA

a/ Total run size.

b/ Preliminary forecast.

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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 2015 ocean salmon management 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 2015 preseason management measures and analyses of their projected effects on the biological and socioeconomic environment are presented in Preseason Report III (PFMC 2015c). A description of the 2015 management measures as implemented, including inseason modifications, and an analysis of their effects on the environment, including an historical perspective, is presented in the SAFE document - Review of 2015 Ocean Salmon Fisheries (PFMC 2016).

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 2016 under the No-Action Alternative (2015 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 2015 Ocean Salmon Fisheries was published. A preliminary determination of stock status under the FMP 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 2016 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; for Columbia River Chinook stocks 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 2016 were updated for Washington and Oregon stocks, but forecasts for Canadian stocks are unchanged from those employed for 2015 planning. Updated forecasts for Canadian stocks are expected to become available in March 2016. To provide information on the effect of changes in abundance forecasts, the final 2015 pre-season regulatory package for ocean and inside fisheries was applied to 2016 projections of abundance.

Sacramento River Fall Chinook

A repeat of 2015 regulations would be expected to result in an escapement of 153,346 hatchery and natural area SRFC adults. This projection exceeds the minimum escapement level specified by the control rule for 2016 (122,000), S_{MSY} (122,000), and the 2016 preseason S_{ACL} (89,883; Tables V-4 and V-5). The geometric mean of the 2014 and 2015 spawning escapement estimates, and the 2016 forecast spawning escapement under the No-Action Alternative, is greater than the MSST, therefore the stock is not approaching an overfished condition. The predicted SRFC exploitation rate under the No-Action Alternative is 0.49, which is below both the MFMT (0.78; Table V-4) and the maximum allowable rate specified by the control rule for 2016 (0.59). If the ocean fisheries were closed from January through August 2016 between Cape Falcon and the U.S./Mexico border, and Sacramento Basin fisheries were closed in 2016, the expected number of hatchery and natural area adult spawners would be 282,618.

The 2015 estimate of SRFC escapement was 112,434, which exceeds the 2015 postseason S_{ACL} of 76,586 (Table V-5).

Sacramento River Winter Chinook

A repeat of 2015 regulations would be expected to result in an age-3 impact rate of 17.1 percent for the area south of Point Arena. The 2016 forecast age-3 impact rate under the No-Action Alternative is lower than the 2016 maximum allowable rate of 19.9 percent.

Klamath River Fall Chinook

A repeat of 2015 fishery regulations, which included a river recreational harvest allocation of 32.4 percent of the non-tribal harvest and a tribal allocation of 50 percent of the overall adult harvest, would be expected to result in 14,540 natural area adult spawners. This projection is lower than the minimum escapement level specified by the control rule for 2016 (30,909) and S_{MSY} (40,700), but exceeds the 2016 preseason S_{ACL} (13,188; Tables V-4 and V-5). The geometric mean of the 2014 and 2015 natural area adult spawner escapement estimates, and the 2016 forecast spawning escapement under the No-Action Alternative, is greater than the MSST; therefore the stock is not approaching an overfished condition. The predicted KRFC exploitation rate under the No-Action Alternative is 0.65, which is lower than the MFMT (0.71; Table V-4) but exceeds the maximum allowable rate specified by the control rule for 2016 (0.25). If the ocean fisheries were closed from January through August 2016 between Cape Falcon and Point Sur, and the Klamath River fisheries (tribal and recreational) were closed in 2016, the expected number of natural area adult spawners would be 41,092.

The 2015 estimate of KRFC escapement was 28,120 natural area adults, which exceeds the 2015 postseason S_{ACL} of 21,929 (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. As indicated in Chapter II, the postseason estimate of this rate for 2015 is 21.3 percent. Applying 2015 regulations to the 2016 KRFC abundance results in an age-4 ocean harvest rate forecast of 17.4 percent. If the ocean fisheries were closed from January through August 2016 between Cape Falcon and Point Sur, the expected age-4 ocean harvest rate would be 0.05 percent (24 age-4 KRFC were harvested during the September through November 2015 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. No forecasts are available for these stocks, but given recent trends, the escapement goals would likely be met again in 2016 under 2015 fishing seasons for the northern and central stock complexes but may not be met for the southern stock complex.

Columbia River Chinook Stocks

The 2016 forecasts are similar to the 2015 forecasts for Columbia River spring stocks. The forecast for summer Chinook is slightly above the previous record high. The 2016 forecasts for bright and tule fall Chinook are strong; the aggregate forecast is slightly above the 2015 forecast and second highest since 2008. Applying 2015 regulations to the forecasted 2016 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 2015 Council area management measures on projected 2016 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 2015 Council regulations and 2015 expectations for non-Council area fisheries. Because of the significant decrease in forecasts for most coho stocks in 2016 relative to the forecasts in 2015, this model run shows dramatic increases in fishery impact rates and provides some indication of the reduction in fishery impacts needed to meet conservation objectives in 2016. Under this scenario, expected exploitation rates are 27.0 percent on OCN coho and 11.9 percent on Rogue/Klamath hatchery coho. Expected ocean escapement is 112,538 for OCN coho (Table V-6). For Columbia River hatchery coho stocks, the predicted ocean exploitation rate (excluding Buoy 10) is 49.9 percent on the Columbia River early stock and 67.8 percent on the Columbia River late stock. Predicted ocean escapements (after Buoy 10) into the Columbia River in 2016 under this exercise show that under 2015 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 2016 fisheries is no greater than 20.0 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 2015 fishery regulations and 2016 abundance forecasts, these exploitation rates are predicted to be 27.0 percent for OCN, and 11.9 percent for RK coho (Table V-7). The 2016 allowable LCN coho exploitation rate is expected to be 18.0 percent in the marine area and mainstem Columbia River fisheries combined pending NMFS ESA guidance. Under 2015 fishery regulations and 2016 abundance forecasts, the exploitation rate is predicted to be 27.1 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 6.6 percent and the estimated exploitation rate in freshwater fisheries would be 8.3 percent. The total exploitation rate on LCN coho would be 42.0 percent, well over the assumed 18% 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 2016 preseason abundance forecasts and 2015 preseason projections for fishing patterns, are presented in Table V-6. The 2016 forecasts for Canadian coho stocks are not available, but are assumed to be at 2015 levels for this analysis. More detailed fishery management goals for Council area coho stocks are listed in Appendix A.

Under 2015 regulations, 2016 exploitation rates are not expected to meet the allowable 2016 FMP conservation objectives for all Puget Sound coho stocks due to reduced abundances in 2016. Ocean abundance forecasts for most Washington Coast natural coho stocks are near or below FMP spawning escapement conservation objectives. Significant adjustments to 2015 regulations will be required in 2016. Management objectives for many U.S. stocks subject to the PSC agreement would not be met under 2015 regulations. The exploitation rate by U.S. fisheries south of the Canadian border on Interior Fraser (B.C.) coho is projected to be 17.6 percent, which is above the anticipated 10.0 percent allowable exploitation rate under the 2002 PST Coho Agreement. The Council area fisheries portion would be 8.7 percent.

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

Summary

The effects of projected impacts (where available) under 2015 fishery regulations and 2016 abundance forecasts are as follows:

- With the exception of KRFC and California Coastal Chinook, Chinook stocks with available information would achieve management objectives.
- For SRFC, the predicted exploitation rate is below the maximum allowable rate specified by the control rule and thus hatchery and natural area adult escapement is greater than the 2016 objective.
- For KRFC, the predicted exploitation rate exceeds the maximum allowable rate specified by the control rule and thus natural area adult escapement is lower than the 2016 objective.
- The KRFC age-4 ocean harvest rate would exceed the California Coastal Chinook ESA consultation standard.
- Of the coho stocks with available information, Willapa and Hood Canal coho would achieve S_{MSY} spawning escapement objectives; Queets, Hoh, Quillayute, Strait of Juan de Fuca, Skagit, Stillaguamish, and Snohomish coho would not.
- Willapa Bay, Hood Canal, Skagit, Stillaguamish, and Snohomish coho would have exploitation rates that exceed the MFMT.
- OCN coho and LCN coho stocks would have projected exploitation rates that exceed ESA consultation standards.
- All Puget Sound coho stocks would have exploitation rates that exceed the annual rates allowed under the FMP harvest rate matrix and the PST 2002 Southern Coho Management Plan.
- All projected escapement of Washington coastal natural coho would be below FMP conservation objectives.

Conclusion

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

- KRFC would not meet control rule-defined exploitation rate and escapement objectives.
- The KRFC age-4 ocean harvest rate would exceed the California Coastal Chinook ESA consultation standard.
- OCN coho and LCN coho stocks would have projected exploitation rates that exceed ESA consultation standards.
- Projected escapement of all Washington coastal natural coho would be below FMP conservation objectives.
- Willapa Bay, Hood Canal, Skagit, Stillaguamish, and Snohomish coho would have exploitation rates that exceed the MFMT.

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 2016 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-1. Commercial troll management measures adopted by the Council for non-Indian ocean salmon fisheries, 2015. (Page 1 of 6)

A. SEASON ALTERNATIVE DESCRIPTIONS

North of Cape Falcon

Supplemental Management Information

1. Overall non-Indian TAC: 131,000 (non-mark-selective equivalent of 125,000) Chinook and 170,000 coho marked with a healed adipose fin clip (marked).
2. Non-Indian commercial troll TAC: 67,000 Chinook and 19,200 marked coho.
3. Trade: Commercial troll traded 8,000 coho to the recreational fishery for 2,000 Chinook.

U.S./Canada Border to Cape Falcon

- May 1 through earlier of June 30 or 40,200 Chinook, no more than 9,000 of which may be caught in the area between the U.S./Canada border and the Queets River and no more than 15,000 may be caught in the area between, Leadbetter Pt. and Cape Falcon.

Seven days per week with a landing and possession limit of 60 Chinook per vessel per trip from the U.S./Canada Border to the Queets River (C.1). All salmon except coho (C.4, C.7). Chinook minimum size limit of 28 inches total length (B). Vessels in possession of salmon north of the Queets River may not cross the Queets River line without first notifying WDFW at 360-902-2739 with area fished, total Chinook 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 360-902-2739 with area fished, total Chinook and halibut catch aboard, and destination. See compliance requirements and gear restrictions and definitions (C.2, C.3). When it is projected that 29,250 Chinook have been landed overall, or 6,750 Chinook have been landed in the area between the U.S./Canada border and the Queets River, or 11,250 Chinook have been landed in the area between Leadbetter Pt. and Cape Falcon, inseason action modifying the open period to five days per week and adding landing and possession limits will be considered to ensure the guideline is not exceeded. Cape Flattery, Mandatory Yelloweye Rockfish Conservation Area, and Columbia Control Zones closed (C.5). Vessels must land and deliver their fish within 24 hours of any closure of this fishery. Under state law, vessels must report their catch on a state fish receiving ticket. Vessels fishing or in possession of salmon while fishing north of Leadbetter Point must land and deliver their 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 their fish within the area and south of Leadbetter Point, except that Oregon permitted vessels may also land their fish in Garibaldi, Oregon. 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).

U.S./Canada Border to Cape Falcon

- July 1 through earlier of September 22 or attainment of the quota of 26,800 Chinook, no more than 11,000 of which may be caught in the area between the U.S./Canada border and the Queets River or 19,200 marked coho (C.8.d).

July 1-7 then Friday through Tuesday July 10 through September 22 with a landing and possession limit of 50 Chinook and 50 coho per vessel per open period (C.1). Vessels in possession of salmon north of the Queets River may not cross the Queets River line without first notifying WDFW at 360-902-2739 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 360-902-2739 with area fished, total Chinook, coho, and halibut catch aboard, and destination. When it is projected that 19,500 Chinook have been landed overall, or 8,250 Chinook have been landed in the area between the U.S./Canada border and the Queets River, inseason action modifying the open period to five days per week and adding landing and possession limits will be considered to ensure the guideline is not exceeded. No earlier than September 1, if at least 5,000 marked coho remain on the quota, inseason action may be considered to allow non-selective coho retention (C.8). All salmon, except no chum retention north of Cape Alava, Washington in August and September (C.7). Chinook minimum size limit of 28 inches total length (B, C.1). All coho must be marked except as noted above (C.8.d). See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3). Mandatory Yelloweye Rockfish Conservation Area, Cape Flattery and Columbia Control Zones, and beginning August 9, Grays Harbor Control Zone closed (C.5). Vessels must land and deliver their fish 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 their 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 their fish within the area and south of Leadbetter Point, except that Oregon permitted vessels may also land their 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).

TABLE V-1. Commercial troll management measures adopted by the Council for non-Indian ocean salmon fisheries, 2015. (Page 2 of 6)

A. SEASON ALTERNATIVE DESCRIPTIONS

South of Cape Falcon

Supplemental Management Information

1. Sacramento River fall Chinook spawning escapement of 341,017 adults.
2. Sacramento Index exploitation rate of 47.7%
3. Klamath River recreational fishery allocation: 14,133 adult Klamath River fall Chinook.
4. Klamath tribal allocation: 43,581 adult Klamath River fall Chinook.

Cape Falcon to Humbug Mountain

- April 1-August 27;
- September 2-30 (C.9.a).

Seven days per week. All salmon except coho (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 fish 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 2, no more than 60 Chinook per vessel per landing week (Thursday through Wednesday).

In 2016, 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 2015. This opening could be modified following Council review at its March 2016 meeting.

Humbug Mountain to OR/CA Border (Oregon KMZ)

- April 1-May 31;
- June 1 through earlier of June 30, or a 1,800 Chinook quota;
- July 1 through earlier of July 31, or a 1,000 Chinook quota;
- August 1 through earlier of August 27, or a 500 Chinook quota (C.9.a).

Seven days per week. All salmon except coho (C.4, C.7). Chinook minimum size limit of 28 inches total length (B, C.1). Prior to June 1, all fish caught in this area must be landed and delivered in the State of Oregon.

June 1 through August 27, single daily landing and possession limit 30 Chinook per vessel per day (C.8.f). Any remaining portion of the June and/or July Chinook quotas may be transferred inseason on an impact neutral basis to the next open quota period. All vessels fishing in this area must land and deliver all fish within this area or Port Orford, within 24 hours of any closure of this fishery, and prior to fishing outside of this area. Oregon State regulations require all fishers landing salmon from any quota managed season within this area to notify ODFW within 1 hour of delivery or prior to transport away from the port of landing by either calling 541-867-0300 ext. 252 or sending notification via e-mail to KMZOR.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. See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3).

In 2016, the season will open March 15 for all salmon except coho, with a 28 inch Chinook minimum size limit. This opening could be modified following Council review at its March 2016 meeting.

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

- September 11 through earlier of September 30, or a 3,000 Chinook quota (C.9.b).

Five days per week, Friday through Tuesday. All salmon except coho (C.4, C.7). Chinook minimum size limit of 28 inches total length (B, C.1). Landing and possession limit of 20 Chinook per vessel per day (C.8.f). 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). See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3). Klamath Control Zone closed (C.5.e). See California State regulations for additional closures adjacent to the Smith and Klamath rivers. 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).

Humboldt South Jetty to Horse Mountain

Closed.

Horse Mountain to Point Arena (Fort Bragg)

- May 1-31;
- June 15-30;
- July 12-31;
- August 1-26;
- September 1-30 (C.9.b).

Seven days per week. All salmon except coho (C.4, C.7). Chinook minimum size limit of 27 inches total length (B, C.1). All fish must be landed in California. All salmon caught in California 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 (C.6). During September, all fish must be landed north of Point Arena (C.6). See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3).

In 2016, 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 2015. All fish caught in the area must be landed in the area. This opening could be modified following Council review at its March 2016 meeting.

TABLE V-1. Commercial troll management measures adopted by the Council for non-Indian ocean salmon fisheries, 2015. (Page 3 of 6)

A. SEASON ALTERNATIVE DESCRIPTIONS

Point Arena to Pigeon Point (San Francisco)

- May 1-31;
- June 7-30;
- July 8-31;
- August 1-29;
- September 1-30 (C.9.b).

Seven days per week. All salmon except coho (C.4, C.7). Chinook minimum size limit of 27 inches total length prior to September 1, 26 inches thereafter (B, C.1). All fish must be landed in California. All salmon caught in California prior to September 1 must be landed and offloaded no later than 11:59 p.m., August 30 (C.6). During September, all fish must be landed south of Point Arena (C.6). See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3).

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

- October 1-2, 5-9, and 12-15.

All salmon except coho (C.4, C.7). Chinook minimum size limit of 26 inches total length (B, C.1). All fish 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 Point Sur (Monterey North)

- May 1-31;
- June 7-30;
- July 8-31;
- August 1-15 (C.9.b).

Seven days per week. All salmon except coho (C.4, C.7). Chinook minimum size limit of 27 inches total length (B, C.1). All fish must be landed in California. All salmon caught in California prior to September 1 must be landed and offloaded no later than 11:59 p.m., August 30 (C.6). See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3).

Point Sur to U.S./Mexico Border (Monterey South)

- May 1-31;
- June 7-30;
- July 8-31 (C.9.b).

Seven days per week. All salmon except coho (C.4, C.7). Chinook minimum size limit of 27 inches total length (B, C.1). All fish must be landed in California. All salmon caught in California prior to September 1 must be landed and offloaded no later than 11:59 p.m., August 30 (C.6). See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3).

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)

B. MINIMUM SIZE (Inches)

	Chinook		Coho		
Area (when open)	Total Length	Head-off	Total Length	Head-off	Pink
North of Cape Falcon	28.0	21.5	16.0	12.0	None
Cape Falcon to OR/CA Border	28.0	21.5	-	-	None
OR/CA Border to Humboldt South Jetty	28.0	21.5	-	-	None
Horse Mt. to Pt. Arena	27.0	20.5	-	-	None
Pt. Arena to Pigeon Pt.					
Prior to August 30	27.0	20.5	-	-	None
Sept. 1 to October 15	26.0	19.5	-	-	None
Pigeon Pt. to U.S./Mexico Border	27.0	20.5	-	-	None

TABLE V-1. Commercial troll management measures adopted by the Council for non-Indian ocean salmon fisheries, 2015. (Page 4 of 6)

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. 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 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 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.
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).

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 amount 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 2016 for 2016 permits (*exact date to be set by the IPHC in early 2016*). Incidental harvest is authorized only during April, May, and June of the 2015 troll seasons and after June 30 in 2015 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 29,035 pound preseason allocation or the total Area 2A non-Indian commercial halibut allocation, NMFS will take inseason action to prohibit retention of halibut in the non-Indian salmon troll fishery.

May 1, 2015 through December 31, 2015 and April 1-30, 2016, license holders may land or possess no more than one Pacific halibut per each four Chinook, except one Pacific halibut may be possessed or landed without meeting the ratio requirement, and no more than 12 halibut may be possessed or landed per trip. Pacific halibut retained must be no less than 32 inches in total length (with head on).

Incidental Pacific halibut catch regulations in the commercial salmon troll fishery adopted for 2015, prior to any 2015 inseason action, will be in effect when incidental Pacific halibut retention opens on April 1, 2016 unless otherwise modified by inseason action at the March 2016 Council meeting.

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 and/or July non-Indian commercial troll quotas in the Oregon 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. NMFS may transfer fish 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 2016 meeting, the Council will consider inseason recommendations for special regulations for any experimental fisheries (proposals must meet Council protocol and be received in November 2015).
e. If retention of unmarked coho 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.

TABLE V-1. Commercial troll management measures adopted by the Council for non-Indian ocean salmon fisheries, 2015. (Page 6 of 6)

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. Recreational management measures adopted by the Council for non-Indian ocean salmon fisheries, 2015. (Page 1 of 4)

A. SEASON ALTERNATIVE DESCRIPTIONS

North of Cape Falcon

Supplemental Management Information

1. Overall non-Indian TAC: 131,000 (non-mark-selective equivalent of 125,000) Chinook and 170,000 coho marked with a healed adipose fin clip (marked).
2. Recreational TAC: 64,000 (non-mark selective equivalent of 58,000) Chinook and 150,800 marked coho; all retained coho must be marked. 2,000 Chinook were traded to commercial troll for 8,000 coho which were added to the quota between Leadbetter Pt. and Cape Falcon.
4. No Area 4B add-on fishery.
5. Buoy 10 fishery opens August 1 with an expected landed catch of 45,000 marked coho in August and September.

U.S./Canada Border to Queets River

- May 15-16, May 22-23, and May 30-June 12 or a coastwide marked Chinook quota of 10,000 (C.5).

Seven days per week. All salmon except coho, two fish per day. All Chinook must be marked with a healed adipose fin clip (C.1). Chinook 24-inch total length minimum size limit (B). See gear restrictions and definitions (C.2, C.3). Inseason management may be used to sustain season length and keep harvest within the overall Chinook recreational TAC for north of Cape Falcon (C.5).

Queets River to Leadbetter Point

- May 30 through earlier of June 12 or a coastwide marked Chinook quota of 10,000 (C.5).

Seven days per week. All salmon except coho, two fish per day. All Chinook must be marked with a healed adipose fin clip (C.1). Chinook 24-inch total length minimum size limit (B). See gear restrictions and definitions (C.2, C.3). Inseason management may be used to sustain season length and keep harvest within the overall Chinook recreational TAC for north of Cape Falcon (C.5).

Leadbetter Point to Cape Falcon

- May 30 through earlier of June 12 or a coastwide marked Chinook quota of 10,000 (C.5).

Seven days per week. All salmon except coho, two fish per day. All Chinook must be marked with a healed adipose fin clip (C.1). Chinook 24-inch total length minimum size limit (B). See gear restrictions and definitions (C.2, C.3). Inseason management may be used to sustain season length and keep harvest within the overall Chinook recreational TAC for north of Cape Falcon (C.5).

U.S./Canada Border to Cape Alava (Neah Bay)

- June 13 through earlier of September 30 or 14,850 marked coho subarea quota with a subarea guideline of 8,400 Chinook (C.5).

Seven days per week. All salmon except no chum beginning August 1; two fish per day plus two additional pink. 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). 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).

Cape Alava to Queets River (La Push Subarea)

- June 13 through earlier of September 30 or 3,610 marked coho subarea quota with a subarea guideline of 2,600 Chinook (C.5).
- October 1 through earlier of October 11 or 100 marked coho quota or 100 Chinook quota (C.5) in the area north of 47°50'00 N. lat. and south of 48°00'00" N. lat.

Seven days per week. All salmon, two fish per day plus two additional pink. All coho must be marked with a healed adipose fin clip (C.1). See gear restrictions and definitions (C.2, C.3). 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).

Queets River to Leadbetter Point (Westport Subarea)

- June 13 through earlier of September 30 or 52,840 marked coho subarea quota with a subarea guideline of 27,900 Chinook (C.5).

Seven days per week. All salmon; two fish per day, no more than one of which can 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 11 (C.4.b). 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).

Leadbetter Point to Cape Falcon (Columbia River Subarea)

- June 13 through earlier of September 30 or 79,400 marked coho subarea quota with a subarea guideline of 15,000 Chinook (C.5).

Seven days per week. All salmon; two fish per day, no more than one of which can 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.). 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 V-2. Recreational management measures adopted by the Council for non-Indian ocean salmon fisheries, 2015**.**
(Page 2 of 4)

A. SEASON ALTERNATIVE DESCRIPTIONS

South of Cape Falcon

Supplemental Management Information

1. Sacramento River fall Chinook spawning escapement of 341,017 adults.
2. Sacramento Index exploitation rate of 47.7%
3. Klamath River recreational fishery allocation: 14,133 adult Klamath River fall Chinook.
4. Klamath tribal allocation: 43,581 adult Klamath River fall Chinook.
5. Overall recreational coho TAC: 55,000 coho marked with a healed adipose fin clip (marked), and 12,500 coho in the non-mark-selective coho fishery.

Cape Falcon to Humbug Mountain

- March 15 through October 31 (C.6), except as provided below during the all-salmon mark-selective and September non-mark-selective coho fisheries.

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

- Non-mark-selective coho fishery: September 4 through the earlier of September 30 or a landed catch of 12,500 coho (C.5).

Seven days per week. All salmon, two fish per day (C.5).
The all salmon except coho season reopens the earlier of October 1 or attainment of the coho quota (C.5).

In 2016, the season between Cape Falcon and Humbug Mountain will open March 15 for all salmon except coho, two fish per day (B, C.1, C.2, C.3).

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).

Cape Falcon to OR/CA Border

- All**-**salmon mark-selective coho fishery: June 27 through earlier of August 9 or a landed catch of 55,000 marked coho.

Seven days per week. All salmon, two fish per day. All retained coho must be marked with a healed adipose fin clip (C.1). Chinook minimum size limit of 24 inches total length (B). See gear restrictions and definitions (C.2, C.3). Any remainder of the mark selective coho quota will be transferred on an impact neutral basis to the September non-selective coho quota from Cape Falcon to Humbug Mountain (C.5). The all salmon except coho season reopens the earlier of August 10 or attainment of the coho quota.

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).

Humbug Mountain to OR/CA Border (Oregon KMZ)

- May 1 through September 7 (C.6).

Seven days per week. All salmon except coho, except as noted above in the all-salmon mark-selective coho fishery; two fish per day (C.1). Chinook minimum size limit of 24 inches total length (B). See gear restrictions and definitions (C.2, C.3).

OR/CA Border to Horse Mountain (California KMZ)

- May 1 through September 7 (C.6).

Seven days per week. All salmon except coho, two fish 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 Mountain to Point Arena (Fort Bragg)

- April 4 through November 8 (C.6).

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

In 2016, season opens April 2 for all salmon except coho, two fish per day (C.1). Chinook minimum size limit of 20 inches total length (B); and the same gear restrictions as in 2015 (C.2, C.3).

Point Arena to Pigeon Point (San Francisco)

- April 4 through October 31 (C.6).

Seven days per week. All salmon except coho, two fish per day (C.1). Chinook minimum size limit of 24 inches total length through April 30, 20 inches thereafter (B). See gear restrictions and definitions (C.2, C.3).

In 2016, season opens April 2 for all salmon except coho, two fish per day (C.1). Chinook minimum size limit of 24 inches total length (B); and the same gear restrictions as in 2015 (C.2, C.3).

TABLE V-2. Recreational management measures adopted by the Council for non-Indian ocean salmon fisheries, 2015. (Page 3 of 4)

A. SEASON ALTERNATIVE DESCRIPTIONS

Pigeon Point to Point Sur (Monterey North)

- April 4 through September 7 (C.6).

Seven days per week. All salmon except coho, two fish per day (C.1). Chinook minimum size limit of 24 inches total length through May 31, 20 inches thereafter (B). See gear restrictions and definitions (C.2, C.3).

In 2016, season opens April 2 for all salmon except coho, two fish per day (C.1). Chinook minimum size limit of 24 inches total length (B); and the same gear restrictions as in 2015 (C.2, C.3).

Point Sur to U.S./Mexico Border (Monterey South)

- April 4 through July 19 (C.6).

Seven days per week. All salmon except coho, two fish per day (C.1). Chinook minimum size limit of 24 inches total length through May 31, 20 inches thereafter (B). See gear restrictions and definitions (C.2, C.3).

In 2016, season opens April 2 for all salmon except coho, two fish per day (C.1). Chinook minimum size limit of 24 inches total length (B); and the same gear restrictions as in 2015 (C.2, C.3).

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		24.0	16.0	None
Cape Falcon to Humbug Mt.		24.0	16.0	None
Humbug Mt. to OR/CA Border		24.0	16.0	None
OR/CA Border to Horse Mt.		20.0	-	20.0
Horse Mt to Pt. Arena		20.0	-	20.0
Pt. Arena to Pigeon Pt.	Through April 30	24.0	-	24.0
	After April 30	20.0	-	20.0
Pigeon Pt. to U.S./Mexico Border	Through May 31	24.0	-	24.0
	After May 31	20.0	-	20.0

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. [Note: ODFW regulations in the state-water fishery off Tillamook Bay may allow the use of barbed hooks to be consistent with inside regulations.]

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.

TABLE V-2. Recreational management measures adopted by the Council for non-Indian ocean salmon fisheries, 2015. (Page 4 of 4)
C. REQUIREMENTS, DEFINITIONS, RESTRICTIONS, OR EXCEPTIONS

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).

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 coho. To remain consistent with preseason expectations, any inseason action shall consider, if significant, the difference between observed and preseason forecasted 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 OR/CA border 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. Treaty Indian ocean troll management measures adopted by the Council for ocean salmon fisheries, 2015**.**
A. SEASON DESCRIPTIONS
Supplemental Management Information
1. Overall Treaty-Indian TAC: 60,000 Chinook and 42,500 coho.
• May 1 through the earlier of June 30 or 30,000 Chinook quota. All salmon 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 30,000 preseason Chinook quota (C.5), or 42,500 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 (All).

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 - That portion of the FMA between 48°07'36" N. lat. (Sand Pt.) and 47°31'42" N. lat. (Queets River) and east of 125°44'00" W. long.

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 - That portion of the FMA between 47°40'06" N. lat. (Destruction Island) and 46°53'18"N. lat. (Point Chehalis) and east of 125°44'00" W. long.

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.)

C.3. Quotas
- a. The quotas include troll catches by the S'Klallam and Makah tribes in Washington State Statistical Area 4B from May 1 through September 15.
- b. The Quileute Tribe will continue a ceremonial and subsistence fishery during the time frame of September 15 through October 15 in the same manner as in 2004-2014. Fish taken during this fishery are to be counted against treaty troll quotas established for the 2015 season (estimated harvest during the October ceremonial and subsistence fishery: 20 Chinook; 40 coho).

C.4. Area Closures
- a. The area within a six nautical mile radius of the mouths of the Queets River (47°31'42" N. lat.) and the Hoh River (47°45'12" N. lat.) will be closed to commercial fishing.
- b. A closure within two nautical miles of the mouth of the Quinault River (47°21'00" N. lat.) may be enacted by the Quinault Nation and/or the State of Washington and will not adversely affect the Secretary of Commerce's management regime.

C.5. 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 treaty-Indian ocean troll harvest guideline north of Cape Falcon may be transferred to the July through September harvest guideline on a fishery impact equivalent basis.

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). 2016 spawning escapement and exploitation rate estimates are based on preliminary 2016 preseason abundance forecasts and 2015 Council regulations. *Corrections were made to this table on March 1, 2016, after the original posting of Preseason Report I.*

	Spawning Escapement								Total Exploitation Rate					
	2012	2013	2014	2015[a/]	Forecast 2016[b/]	3-yr Geo Mean	MSST	S_{MSY}	2012	2013	2014	2015[a/]	2016[b/]	MFMT
Chinook														
Sacramento Fall	285,429	406,200	212,468	112,434	153,346	154,154	91,500	122,000	0.54	0.53	0.62	0.56	0.49	0.78
Klamath River Fall	121,543	59,156	95,104	28,120	14,540	33,879	30,525	40,700	0.45	0.64	0.36	0.59	0.65	0.71
Southern Oregon[c/]	69,060	81,855	53,518	31,286	NA	51,558	20,500	34,992	NA	NA	NA	NA	NA	0.54
Central and Northern OR	146	189	157	247	NA	194	30 fish/mi	60 fish/mi	0.65	NA	NA	NA	NA	0.78
Upper River Bright - Fall[d/]	94,925	305,445	233,934	295,000	239,234	254,632	19,182	39,625	0.55	0.53	NA	NA	NA	0.86
Upper River - Summer[d/]	52,184	68,380	77,982	88,691	65,217	76,691	6,072	12,143	**0.78**	0.57	NA	NA	NA	0.75
Willapa Bay - Fall[e/]	2,687	1,916	2,136	NA	NA	2,224	1,696	3,393	**0.83**	0.74	NA	NA	NA	0.78
Grays Harbor Fall[e/]	14,032	12,582	NA	NA	NA	13,287	5,694	11,388	**0.83**	0.74	NA	NA	NA	0.78
Grays Harbor Spring	878	2,459	1,583	NA	NA	1,506	546	1,092	NA	NA	NA	NA	NA	0.78
Queets - Fall[d/]	3,707	2,582	3,820	NA	NA	3,319	1,250	2,500	0.83	0.74	NA	NA	NA	0.87
Queets - Sp/Su	760	520	377	NA	NA	530	350	700	NA	NA	NA	NA	NA	0.78
Hoh - Fall[e/]	1,937	1,269	1,933	1,592	NA	1,575	600	1,200	0.83	0.74	NA	NA	NA	0.90
Hoh Sp/Su	915	750	744	1,070	NA	842	450	900	NA	NA	NA	NA	NA	0.78
Quillayute - Fall[e/]	3,518	4,017	2,782	3,098	NA	3,259	1,500	3,000	0.83	0.74	NA	NA	NA	0.87
Quillayute - Sp/Su	729	957	608	824	NA	783	600	1,200	NA	NA	NA	NA	NA	0.78
Hoko -Su/Fa[d/]	663	1,406	1,760	2,998	NA	1,950	425	850	0.34	0.67	NA	NA	NA	0.78
Coho														
Willapa Bay	18,880	22,638	41,969	NA	4,013	15,622	8,600	17,200	0.50	NA	NA	NA	**0.90**	0.74
Grays Harbor	66,836	56,785	104,836	NA	NA	73,550	18,320	24,426	0.44	0.44	0.46	NA	NA	0.65
Queets	4,285	5,684	7,174	NA	2,022	4,352	4,350	5,800	0.30	0.39	0.44	NA	0.43	0.65
Hoh	4,072	2,899	4,565	2,083	734	1,911	1,890	2,520	0.46	**0.70**	0.43	NA	0.65	0.65
Quillayute Fall	5,846	7,063	7,410	3,079	2,446	3,821	4,725	6,300	0.53	0.55	0.50	NA	0.46	0.59
Juan de Fuca	13,096	9,564	13,651	NA	3,350	7,591	7,000	11,000	0.12	0.43	0.17	NA	0.22	0.60
Hood Canal	46,802	16,786	27,365	NA	9,277	16,213	10,750	14,350	**0.70**	0.55	**0.66**	NA	**0.74**	0.65
Skagit	109,763	88,246	27,059	NA	2,731	18,683	14,875	25,000	0.31	0.44	0.50	NA	**0.70**	0.60
Stillaguamish	45,156	60,387	35,763	NA	0	NA	6,100	10,000	0.29	0.33	0.40	NA	**1.00**	0.50
Snohomish	130,637	125,870	46,244	NA	1,922	22,365	31,000	50,000	0.31	0.39	0.43	NA	**0.89**	0.60

a/ Preliminary.

b/ Preliminary approximations based on preseason abundance projections and 2015 regulations. For an indication of stock status for stocks without a 2016 forecast of escapement, see *Review of 2015 Ocean Salmon Fisheries (PFMC 2016)*, *Table II-6 and Table III-7*.

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) and Klamath River fall Chinook (KRFC). For the current year, S_{ACL}, S_{OFL}, and spawner escapements are preseason values based on current abundance forecasts and the previous year fishing regulations.

	SRFC			KRFC		
Year	S_{ACL} [a/]	S_{OFL}	Escapement [b/]	S_{ACL} [a/]	S_{OFL}	Escapement [c/]
2012	187,595	137,570	285,429	70,936	64,286	121,543
2013	260,456	191,001	406,200	52,065	47,184	59,156
2014	165,978	121,717	212,468	47,539	43,083	95,104
2015	76,586	56,163	112,434	21,929	19,873	28,120
2016	89,883	65,914	153,346	13,188	11,951	14,540

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

b/ Hatchery and natural area adult spawners.

c/ Natural area adult spawners.

TABLE V-6. Estimated ocean escapements and exploitation rates for critical natural and Columbia River hatchery coho stocks (thousands of fish) based on preliminary 2016 preseason abundance forecasts and 2015 Council management measures.[a/] *Corrections were made to this table on March 1, 2016, after the original posting of Preseason Report I.*

	Ocean Escapement and ER Estimates Under 2015 Regulations [b/]				
	2016 Preseason		2015 Preseason		2016 FMP Conservation
Stock	Abundance	Exploitation Rate	Abundance	Exploitation Rate	Objective [c/]
Natural Coho Stocks					
Skagit	7.8	69.6%	113.1	39.1%	Exploitation Rate ≤20.0% [d/]
Stillaguamish	2.6	100.0%	30.0	34.4%	Exploitation Rate ≤20.0% [d/]
Snohomish	15.6	88.6%	145.5	32.7%	Exploitation Rate ≤20.0% [d/]
Hood Canal	31.1	74.0%	56.9	53.8%	Exploitation Rate ≤45.0% [d/]
Strait of Juan de Fuca	4.0	24.7%	10.5	12.6%	Exploitation Rate ≤20.0% [d/]
Quillayute Fall	3.8	45.6%	9.8	40.3%	6.3 - 15.8 Spawners
Hoh	1.4	64.9%	4.3	56.1%	2.0 - 5.0 Spawners
Queets	2.4	43.3%	6.2	30.7%	5.8 - 14.5 Spawners
Grays Harbor [e/]	NA	NA	127.6	47.2%	35.4 Spawners
LCN	29.9	42.0%	41.9	23.0%	Exploitation Rate ≤18.0 [f/]
OCN	112.5	27.0%	176.7	14.9%	Exploitation Rate ≤20.0% [f/]
R/K	6.0	11.9%	NA	6.8%	Exploitation Rate ≤13.0% [f/]
Hatchery Coho Stocks					
Columbia Early	42.3	49.9%	331.5	28.0%	6.2 Hatchery Escapement
Columbia Late	59.2	67.8%	155.5	38.9%	14.2 Hatchery Escapement

a/ Quota levels include harvest and hooking mortality estimates used in planning the Council's 2015 ocean fisheries and a coho catch for the Canadian troll fishery off the West Coast of Vancouver Island (WCVI).

b/ 2015 preseason regulations with the following coho quotas: U.S. Canada Border to Cape Falcon: Treaty Indian troll-42,500 non-selective; non-Indian troll-19,200 selective; recreational-150,800 selective; Cape Falcon to OR/CA border: recreational-55,000 selective and 12,500 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 estimated number of coho entering Puget Sound (Area 4B) which are available for U.S. net fisheries in Puget Sound and spawning escapement after Canadian and Puget Sound troll and recreational fisheries impacts have been deducted. 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 Council fisheries exploitation rates are forecast at 27.1% using 2016 abundances with 2015 fishery regulations and 13.6% in 2015 with the 2015 ESA limit of 23.0% 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/ The Grays Harbor natural coho forecast was not agreed to by comanagers at the time of print. Using the Quinault Indian Nation forecast resulted in an ocean escapement of 29,953 Grays Harbor natural coho; using the WDFW forecast resulted in an ocean escapement of 36,809 Grays Harbor natural coho. The difference in forecasts did not significantly affect escapement or ER values for any other stock shown.

f/ Pending confirmation of 2015 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 2015 management measures and preliminary 2016 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	89	0.2%	508	0.3%	12	0.2%
PUGET SOUND/STRAITS	227	0.5%	154	0.1%	0	0.0%
NORTH OF CAPE FALCON						
Recreational	5,249	11.6%	3,218	2.1%	5	0.1%
Treaty Indian Troll	1,924	4.3%	1,521	1.0%	0	0.0%
Non-Indian Troll	1,488	3.3%	1,085	0.7%	1	0.0%
SOUTH OF CAPE FALCON						
Recreational:						
Cape Falcon to Humbug Mt.	2,489	5.4%	19,094	11.9%	122	0.8%
Humbug Mt. to Horse Mt. (KMZ)	38	0.2%	1,009	1.1%	214	4.2%
Fort Bragg	23	0.1%	817	0.5%	114	1.7%
South of Pt. Arena	19	0.0%	689	0.4%	75	1.1%
Troll:						
Cape Falcon to Humbug Mt.	626	1.4%	2,852	1.8%	24	0.3%
Humbug Mt. to Horse Mt. (KMZ)	0	0.0%	48	0.1%	12	0.2%
Fort Bragg	39	0.1%	1,896	1.2%	196	2.9%
South of Pt. Arena	20	0.0%	673	0.4%	22	0.3%
BUOY 10	2,998	6.6%	815	0.5%	0	0.0%
ESTUARY/FRESHWATER	3,320	8.3%	7,280	4.7%	16	0.2%
TOTAL	18,549	42.0%	41,659	27.0%	813	11.9%

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 (Appendix A, Table A-2) and the revised OCN work group matrix (Appendix A, Table A-4) 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	Jack Survival Rate (t-1)	OCN Adult Survival Rate	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	-	-	-	High	-	-	High	-
2018	2015	6,600	19,800	30,600	-	-	-	Low	-	-	Low	-

a/ Developed by the OCN Coho Work Group as a result of the 2000 Review of Amendment 13.

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

LIST OF TABLES

LIST OF FIGURES

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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 (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.		1,092	546	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)	8,200 adult return to hatchery. WDFW spawning escapement objective of 9,800 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. No more than 10.0% Southern U.S. (SUS) Rebuilding Exploitation Rate (RER) for the Elwha River and for the Dungeness River. 2011 comanagers Resource Management Plan (RMP)	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. No more than 50.0% total RER. 2011 comanagers RMP		Undefined		Undefined	
Mid Hood Canal Summer/Fall	NMFS consultation standard/recovery plan. No more than 15.0% preterminal SUS CERC. 2011 comanagers RMP		Undefined		Undefined	
Nooksack Spring early	NMFS consultation standard/recovery plan. No more than 7.0% SUS CERC. 2011 comanagers RMP		Undefined		Undefined	
Skagit Summer/Fall	NMFS consultation standard/recovery plan. No more than 50.0% total RER. 2011 comanagers RMP		Undefined		Undefined	
Skagit Spring	NMFS consultation standard/recovery plan. No more than 38.0% total RER. 2011 comanagers RMP		Undefined		Undefined	
Stillaguamish Summer/Fall	NMFS consultation standard/recovery plan. No more than 25.0% total RER. 2011 comanagers RMP		Undefined		Undefined	
Snohomish Summer/Fall	NMFS consultation standard/recovery plan. No more than 15.0% SUS RER. 2011 comanagers RMP		Undefined		Undefined	
Cedar River Summer/Fall	NMFS consultation standard/recovery plan. No more than 20.0% SUS RER. 2011 comanagers RMP		Undefined		Undefined	
White River Spring	NMFS consultation standard/recovery plan. No more than 20.0% total RER. 2011 comanagers RMP		Undefined		Undefined	
Green River Summer/Fall	NMFS consultation standard/recovery plan. No more than 15.0% preterminal SUS RER, at least 5,800 adult spawners.		Undefined		Undefined	
Nisqually River Summer/Fall	NMFS consultation standard/recovery plan. No more than 65.0% total RER. 2011 comanagers RMP		Undefined		Undefined	
Puyallup Summer/Fall	NMFS consultation standard/recovery plan. No more than 50.0% total RER. 2011 comanagers RMP		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:	Nehalem	Tillamook	Nestucca	Ocean Tribs.	
(Necanicum River to Neskowin Creek)	17,500	2,000	1,800	400	
North-Central:	Siletz	Yaquina	Alsea	Siuslaw	Ocean Tribs.
(Salmon River to Siuslaw River)	4,300	7,100	15,100	22,800	5,700
South-Central:	Umpqua	Coos	Coquille	Coastal Lakes	
(Siltcoos River to Sixes River)	29,400	7,200	5,400	8,000	
Southern:	Rogue				
(Elk River to Winchuck River)	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

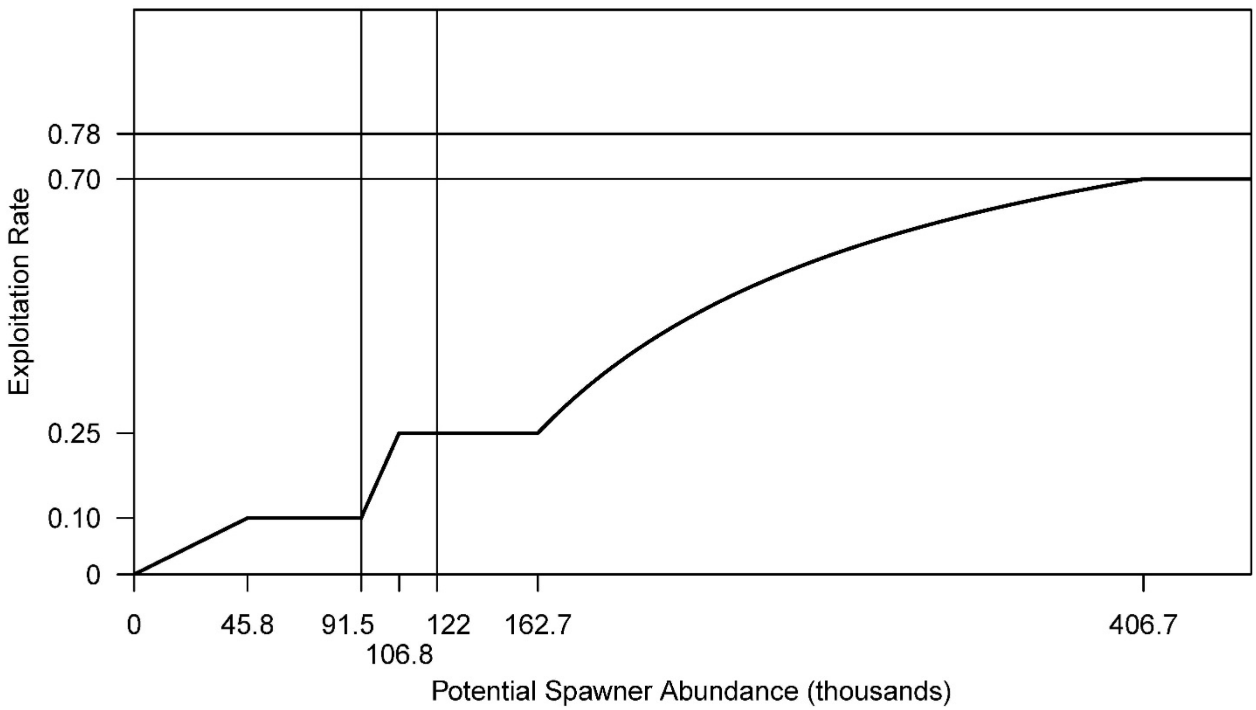

FIGURE A-1. Sacramento River fall Chinook control rule. Potential spawner abundance is the predicted hatchery and natural area adult spawners in the absence of fisheries, which is equivalent to the Sacramento Index. See the salmon FMP, Section 3.3.6, for control rule details.

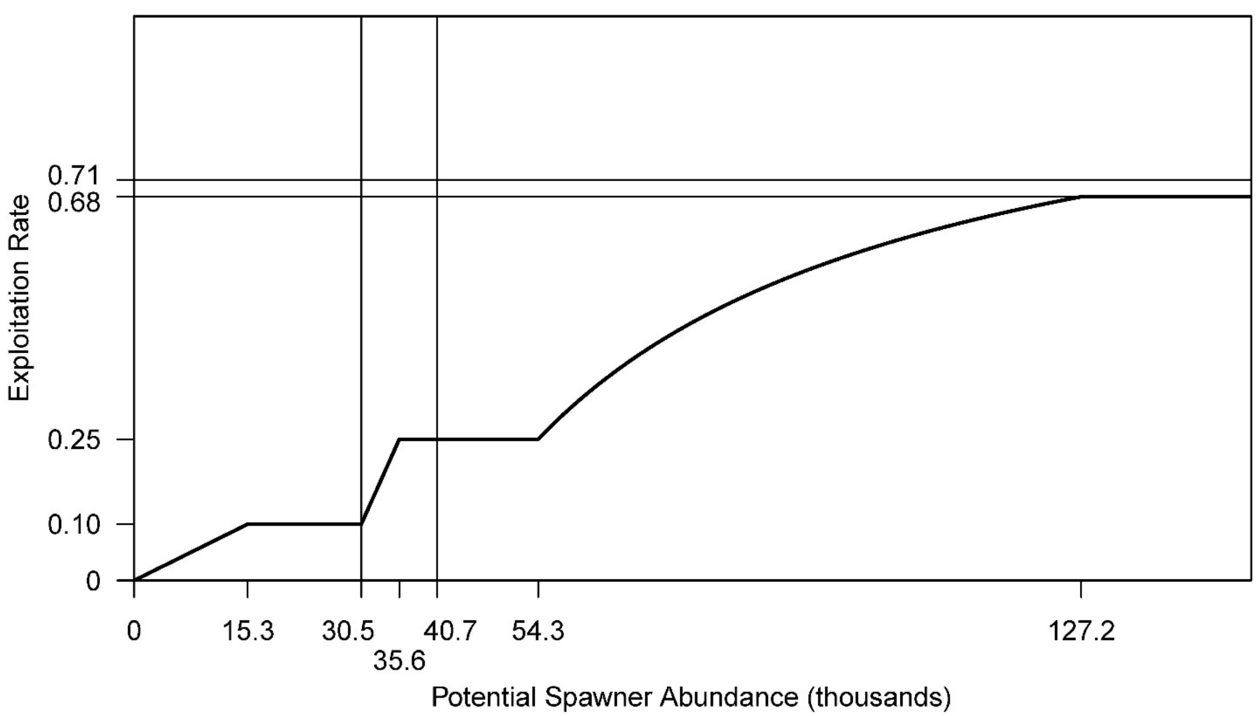

FIGURE A-2. Klamath River fall Chinook control rule. Potential spawner abundance is the predicted natural area adult spawners in the absence of fisheries. See the salmon FMP, Section 3.3.6, for control rule details.

SACRAMENTO RIVER WINTER CHINOOK CONTROL RULE

The first component of the SRWC consultation standard consists of time/area/fishery closure and size limit provisions described in Chapter II and Table A-1.

The second component of the SRWC consultation standard is a control rule that specifies the maximum forecast age-3 impact rate for the area south of Point Arena, California, as a function of the geometric mean of escapement from the most recent three years. This control rule is depicted in Figure A-3, and a description follows.

When the three-year geometric mean of spawner escapement is in excess of 5,000, a maximum forecast age-3 impact rate is not specified and the consultation standard reduces to only the first component. When the three-year geometric mean is between 4,000 and 5,000, the maximum forecast age-3 impact rate is 0.20. Between 3-year geometric mean values of 4,000 and 500, the maximum forecast age-3 impact rate decreases linearly from 0.20 to 0.10. Finally, at 3-year geometric mean spawner levels less than 500, the maximum forecast age-3 impact rate is zero.

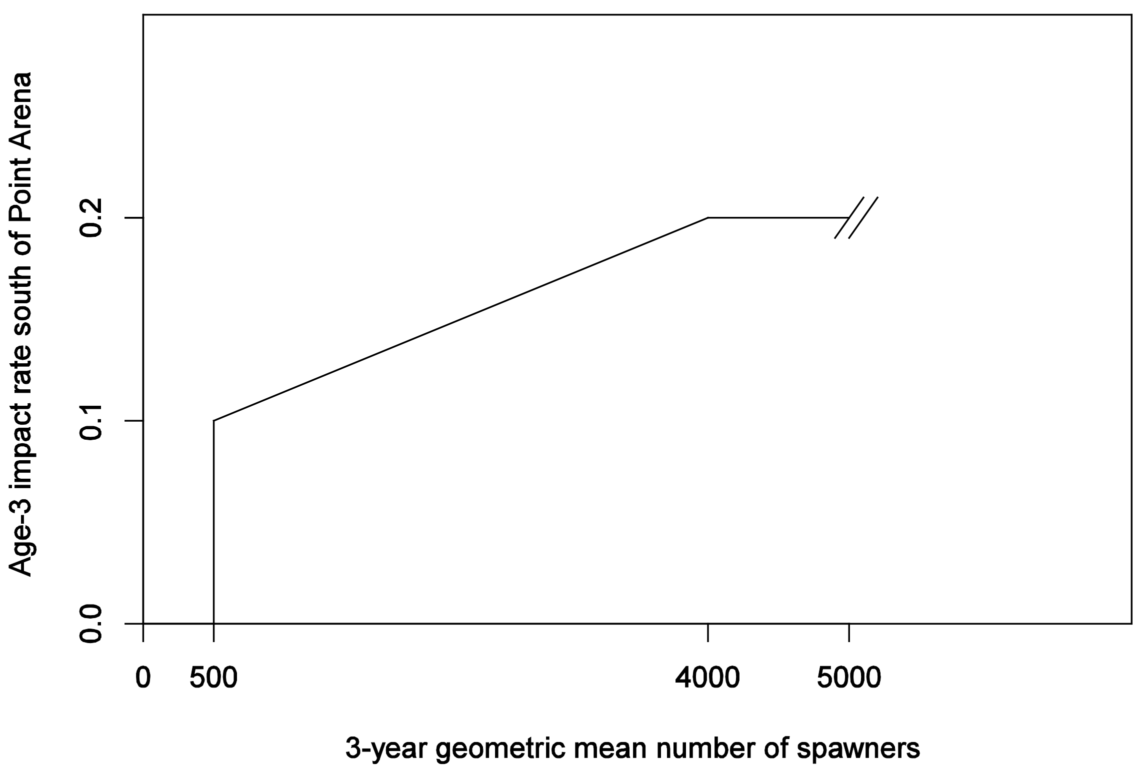

FIGURE A-3. Sacramento River winter Chinook impact rate control rule; maximum forecast age-3 impact rate for the area south of Point Arena, California, as a function of the geometric mean of escapement from the most recent three years.

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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/] Troll	Percentage[a/] Recreational	Harvest (thousands of fish)	Percentage[a/] Troll	Percentage[a/] 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/]					
								Neah Bay		
	Columbia River	Westport	La Push	Neah Bay	Columbia River	Westport	La Push	Ocean	Add-on	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%

    b. South of Humbug Mountain - 30%

In addition,

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

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

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

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. In 2008, a new 10 year management agreement was negotiated through the U.S. v. Oregon process, which included revisions to some in-river objectives. This most recent plan is the "2008-2017 U.S. v Oregon Management Agreement". The plan 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	10.4	3.7	15.3	19.0	5.9	35.2	5.3	-	5.3	1.5	42.0
1992	11.5	4.3	14.3	18.6	2.7	32.8	6.2	-	6.2	0.7	39.7
1993	11.1	4.3	14.8	19.1	4.1	34.3	4.3	-	4.3	0.8	39.4
1994	9.1	2.5	12.0	14.5	3.0	26.6	5.2	-	5.2	0.6	32.4
1995	7.1	3.4	12.9	16.3	1.7	25.1	3.7	-	3.7	0.7	29.5
1996	8.4	3.4	12.9	16.3	3.4	28.1	3.3	-	3.3	0.3	31.7
1997	6.1	3.2	7.8	11.0	3.9	21.0	2.9	-	2.9	0.7	24.6
1998	6.1	5.8	11.4	17.2	3.6	26.8	1.7	-	1.7	0.6	29.1
1999	7.6	4.0	11.5	15.5	4.8	27.9	1.0	-	1.0	0.7	29.6
2000	7.8	6.2	10.8	17.0	5.9	30.7	0.9	-	0.9	0.6	32.2
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[c/]	5.7	2.1	7.4	9.5	3.0	18.2	0.3	-	0.3	0.4	18.9

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. (Page 1 of 2)

Year (t)	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	2,765.1	-	-	-	-	-	-	-	-
1971	3,365.0	-	179.4	172.8	6.6	28.8	24.0	0.0	0.0000
1972	1,924.8	-	103.7	100.8	2.9	33.4	28.3	0.0	0.0000
1973	1,817.0	-	91.4	85.7	5.7	35.3	28.1	1.8	5.1592
1974	3,071.1	-	144.2	132.0	12.1	33.6	25.6	2.9	13.4316
1975	1,652.8	-	76.2	75.1	1.1	32.5	26.0	1.8	4.8626
1976	3,885.3	-	171.5	146.2	25.3	34.0	27.0	2.0	10.0828
1977	987.5	-	53.8	46.3	7.5	33.5	28.7	0.2	0.3204
1978	1,824.1	-	103.2	99.2	4.0	35.5	31.4	0.0	0.0000
1979	1,476.7	-	72.5	64.1	8.4	37.1	27.6	5.0	9.8313
1980	1,224.0	-	57.7	51.6	6.0	34.2	22.2	6.7	11.9626
1981	1,064.5	-	48.7	40.6	8.1	32.3	22.5	5.6	8.0911
1982	1,266.8	-	61.3	55.0	6.3	37.2	25.6	6.8	11.5432
1983[j/]	599.2	-	68.3	61.0	7.2	32.6	22.7	5.0	11.0108
1984	691.3	-	31.6	28.0	3.6	30.9	21.9	5.1	5.2889
1985	717.5	-	26.0	18.2	7.8	34.4	20.1	9.1	5.6719
1986	2,435.8	2,412.0	77.5	64.6	12.9	32.8	16.6	12.2	27.3653
1987	887.2	779.4	32.9	24.2	8.7	39.5	23.9	9.0	6.6201
1988	1,669.3	1,467.8	85.2	72.3	12.9	35.0	21.1	7.7	19.3302
1989	1,720.2	1,922.0	60.8	55.0	5.8	36.0	22.3	7.2	13.4237
1990	718.4	713.6	46.6	37.1	9.6	35.9	21.1	8.5	10.6537
1991	1,874.8	1,816.5	68.6	60.7	7.9	37.2	23.2	7.1	14.2234
1992	543.6	512.6	25.6	19.9	5.7	42.1	29.3	6.0	3.3824
1993	261.7	223.3	27.1	19.6	7.5	38.6	27.3	5.5	3.2866
1994	202.3	214.1	5.2	3.9	1.3	39.5	28.4	6.0	0.6802
1995	147.2	139.4	11.8	9.1	2.7	32.2	23.5	3.1	1.0605
1996	185.2	176.5	17.4	14.1	3.2	29.6	21.0	4.2	2.3500
1997	200.7	195.6	20.4	15.8	4.6	31.5	24.6	3.4	1.9186
1998	207.5	228.3	9.7	6.7	3.0	24.6	18.5	2.5	0.7976
1999	334.5	372.5	29.5	23.6	5.9	29.0	23.8	3.0	2.6418
2000	673.2	673.1	34.8	31.3	3.5	30.2	23.8	4.1	4.5996
2001	1,417.1	1,478.7	87.4	71.7	15.7	32.0	28.6	2.0	4.6863
2002	649.8	689.5	25.2	18.9	6.3	25.0	22.1	1.4	1.1260
2003	936.6	1,009.9	49.9	41.7	8.2	25.3	23.4	0.3	0.5278
2004	622.1	693.6	35.4	29.4	6.0	24.5	21.2	2.0	2.5345
2005	443.2	454.0	25.0	21.2	3.8	23.2	21.2	0.8	0.7709
2006	440.6	523.4	25.9	20.9	5.0	21.8	20.2	0.4	0.4058
2007	476.6	545.3	36.4	34.2	2.2	21.6	20.3	0.1	0.1676
2008	565.3	576.9	16.1	14.9	1.2	22.7	20.8	0.6	0.3925
2009	1,066.2	1,051.0	60.4	58.4	2.0	22.7	20.8	1.1	2.9333

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

	Adults (t)		Jacks (t-1)			Columbia River Smolts (t-1)			
Year (t)	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/]
2010	551.3	546.5	25.2	23.8	1.4	22.3	21.1	0.2	0.2235
2011	442.3	454.2	23.3	22.2	1.1	19.4	18.2	0.3	0.3600
2012	182.3	183.1	17.9	13.9	4.0	19.9	18.1	0.9	0.6584
2013	316.9	314.8	26.3	24.1	2.2	19.2	17.1	1.1	1.4566
2014	1,263.6	1,263.6	51.4	49.4	2.0	19.6	18.0	0.6	1.5935
2015	251.7	251.7	39.8	37.0	2.8	19.4	16.9	1.5	3.0163
2016	.	396.5 [k/]	19.8	18.8	1.0	18.9	16.9	1.3	1.1534

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/ Data not used in subsequent 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/]	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2000-2015 Avg.
NORTHERN																	
Necanicum	359	4,832	2,047	2,377	2,198	1,218	750	431	1,055	3,827	4,445	2,120	902	798	5,727	839	2,120
Nehalem	14,462	21,928	17,164	32,517	18,736	10,451	11,614	14,033	17,205	21,753	32,215	15,322	2,963	4,539	30,577	2,121	16,725
Tillamook	2,178	1,944	13,334	13,008	2,532	1,995	8,774	2,295	4,828	16,251	14,890	19,250	1,686	4,402	20,090	1,553	8,063
Nestucca	1,219	4,164	16,698	10,194	4,695	686	1,876	394	1,844	4,252	1,947	7,857	1,751	946	6,369	1,813	4,169
Ind. Tribs.	0	71	16	0	661	2,116	1,121	376	639	2,052	1,473	1,341	218	271	4,607	261	951
TOTAL	18,218	32,939	49,259	58,096	28,822	16,466	24,135	17,529	25,571	48,135	54,970	45,890	7,520	10,956	67,370	6,587	32,029
NORTH CENTRAL																	
Salmon	179	225	543	42	1,642	79	513	59	652	753	1,382	3,636	297	1,165	3,680	276	945
Siletz	3,387	1,595	2,129	8,038	8,179	14,567	5,205	2,197	20,634	24,070	6,283	33,094	4,495	7,660	19,496	1,974	10,188
Yaquina	637	3,589	23,800	16,484	5,539	3,441	4,247	3,158	10,913	11,182	8,589	19,074	6,268	3,553	25,582	2,027	9,255
Beaver Ck.	1,464	1,832	3,217	5,552	4,569	2,264	1,950	611	1,218	3,575	2,072	2,389	1,878	2,015	6,564	315	2,593
Alsea	3,363	3,228	9,073	10,281	5,233	13,907	1,972	2,146	13,320	14,638	9,688	28,337	8,470	9,283	25,786	5,532	10,266
Siuslaw	6,532	10,606	55,445	29,003	8,729	16,907	5,869	3,552	17,491	30,607	25,983	28,082	11,946	14,118	38,896	8,669	19,527
Ind. Tribs.	91	816	5,308	1,852	8,179	242	1,468	547	3,910	1,610	2,548	4,487	492	1,929	1,890	1,025	2,275
TOTAL	15,653	21,891	99,515	71,252	42,070	51,407	21,224	12,270	68,138	86,435	56,545	119,099	33,846	39,723	121,894	19,818	55,049
SOUTH CENTRAL																	
Umpqua	14,594	35,084	43,504	34,783	29,920	42,532	18,092	11,783	37,868	57,984	70,019	94,655	20,969	27,016	66,272	12,238	38,582
Coos	4,704	33,595	33,120	25,761	23,337	17,048	11,266	1,329	14,881	26,979	27,658	10,999	9,414	6,884	38,880	4,354	18,138
Coquille	6,253	13,833	7,676	22,403	22,138	11,806	28,577	13,968	8,791	22,286	23,564	55,667	5,911	23,637	41,660	7,082	19,703
Floras Ck.	1,477	5,664	3,272	952	7,446	506	1,104	340	786	3,203	11,329	9,217	2,502	1,936	1,022	2,142	3,306
Sixes R.	136	95	95	86	403	105	294	97	43	176	92	334	34	567	410	66	190
Coastal Lakes	12,747	19,604	21,977	16,076	18,642	14,725	24,127	8,955	23,608	17,349	38,744	20,281	18,922	13,659	22,010	4,729	18,510
Ind. Tribs.	-	-	-	-	-	-	-	-	0	188	484	101	48	33	106	0	120
TOTAL	39,911	107,875	109,644	100,061	101,886	86,722	83,460	36,472	85,977	128,165	171,890	191,254	57,800	73,732	170,360	30,611	98,489
SOUTH																	
Rogue[b/]	10,978	12,015	8,460	6,805	24,509	9,957	3,911	5,136	414	2,566	3,671	4,545	5,474	11,210	2,337	4,072	7,254
COASTWIDE	84,760	174,720	266,878	236,214	197,287	164,552	132,730	71,407	180,100	265,301	287,076	360,788	104,640	135,621	361,961	61,088	192,820

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.
(Page 1 of 2)

	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	183.1	204.7	-0.25	41.41	-31.81	-142.53	10.88	-	-1.08	78
1971	416.3	198.9	-0.33	28.96	-16.05	-62.00	11.69	8.62	-1.38	106
1972	185.5	129.2	-0.50	33.79	-8.15	-55.60	11.85	8.38	1.70	107
1973	235.0	51.2	-0.82	41.15	-19.50	-149.03	12.25	9.44	-1.58	80
1974	196.4	65.6	-1.08	33.20	-8.79	-70.03	10.94	9.27	-1.15	102
1975	208.4	24.1	-1.05	38.46	-38.99	-147.33	10.83	9.47	-1.88	83
1976	451.7	37.8	-0.82	22.62	-7.94	-109.57	10.69	9.04	0.71	103
1977	161.2	28.1	-0.52	30.15	-34.77	-134.00	11.20	9.77	0.98	74
1978	111.6	34.8	-0.26	16.88	-5.59	-85.27	11.58	11.29	0.08	97
1979	188.8	39.2	-0.22	24.03	-58.73	-90.47	11.22	8.70	0.71	73
1980	108.3	13.7	0.17	48.08	-42.72	-63.30	12.06	10.52	0.23	78
1981	174.5	18.2	0.34	28.80	-54.11	-80.97	12.16	11.79	0.04	88
1982	185.7	38.4	0.62	28.85	-42.97	-68.40	10.98	9.86	2.23	109
1983	96.0	25.6	0.57	26.44	-46.62	-4.80	12.14	11.14	-0.05	126
1984	94.7	30.1	1.03	38.12	-52.44	-63.23	11.43	10.67	-0.17	112
1985	124.9	68.3	1.04	36.91	-12.17	-80.57	10.95	10.00	-0.10	48
1986	114.3	19.4	0.79	38.46	-19.72	-82.30	11.51	10.04	0.92	89
1987	77.8	59.7	1.14	36.07	-34.08	-80.60	11.43	10.60	1.46	81
1988	152.5	66.3	0.88	42.69	-20.23	-63.23	11.49	9.89	-1.38	68
1989	114.9	57.2	0.99	35.53	-4.82	-65.87	11.62	9.41	-0.18	97
1990	63.3	25.3	1.02	42.94	-12.08	-64.70	12.01	9.97	0.34	81
1991	84.1	45.7	0.83	39.48	-2.08	-111.30	10.92	8.92	1.11	99
1992	107.6	40.7	0.28	36.75	-24.99	-31.23	12.72	10.12	0.63	123
1993	74.9	16.9	0.45	40.86	0.14	58.23	13.24	9.36	0.95	161
1994	41.0	30.4	0.88	39.04	-13.29	-65.40	11.45	11.04	1.35	87
1995	47.8	40.2	0.93	27.53	-25.29	-65.93	11.19	10.58	-0.46	95
1996	64.5	45.2	1.48	56.80	-4.70	-48.80	11.44	11.66	-0.24	120
1997	16.3	38.3	1.42	10.18	-55.94	-16.20	12.10	10.76	2.50	146
1998	22.4	42.8	1.43	49.68	-43.26	-42.97	11.38	12.26	-0.95	105
1999	38.3	60.5	1.37	51.00	-34.18	-112.70	10.67	9.54	-1.01	91
2000	58.7	14.8	0.78	35.78	-26.83	-56.73	11.36	10.00	-0.54	72

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. (Page 2 of 2)

	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
2001	156.5	20.9	0.35	47.08	-38.19	-126.73	10.68	10.16	-0.21	61.00
2002	246.1	36.4	-0.40	50.49	-25.90	-149.23	10.11	10.07	1.03	80.00
2003	227.3	57.4	-0.60	55.48	-26.35	-64.07	11.08	10.96	0.53	112.00
2004	164.0	152.9	-0.17	26.99	4.34	-63.33	11.86	10.30	0.66	110.00
2005	146.3	238.4	0.04	51.75	-9.01	-26.37	12.55	10.21	-0.26	145.00
2006	113.1	211.9	0.52	53.57	-14.10	-37.10	11.15	11.46	1.13	112.00
2007	64.8	156.7	0.79	27.53	-9.88	-124.50	10.62	9.84	-1.11	74.00
2008	157.0	139.4	0.64	32.71	-10.66	-114.07	9.62	8.92	-0.61	89.00
2009	262.9	104.5	0.16	24.33	-47.08	-96.90	10.45	9.37	1.06	82.00
2010	255.7	57.2	-0.29	34.21	-32.89	-49.40	11.68	10.76	-1.71	100.00
2011	352.5	141.8	-0.50	29.33	-26.30	-47.17	10.70	10.12	-0.91	100.00
2012	98.2	245.4	-0.81	53.55	-29.90	-35.40	11.02	9.18	0.17	121.00
2013	130.0	241.6	-0.75	35.30	-7.81	-107.63	10.66	9.89	0.05	100.00
2014	402.3	336.0	-0.76	41.26	-40.11	-31.07	11.17	9.06	0.59	101.00
2015	64.6	80.2	-0.43	40.41	-7.85	-66.50	10.28	12.30	2.27	92.00
2016[b/]	136.7	-	-	-	-	-	-	10.99	-	-

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)

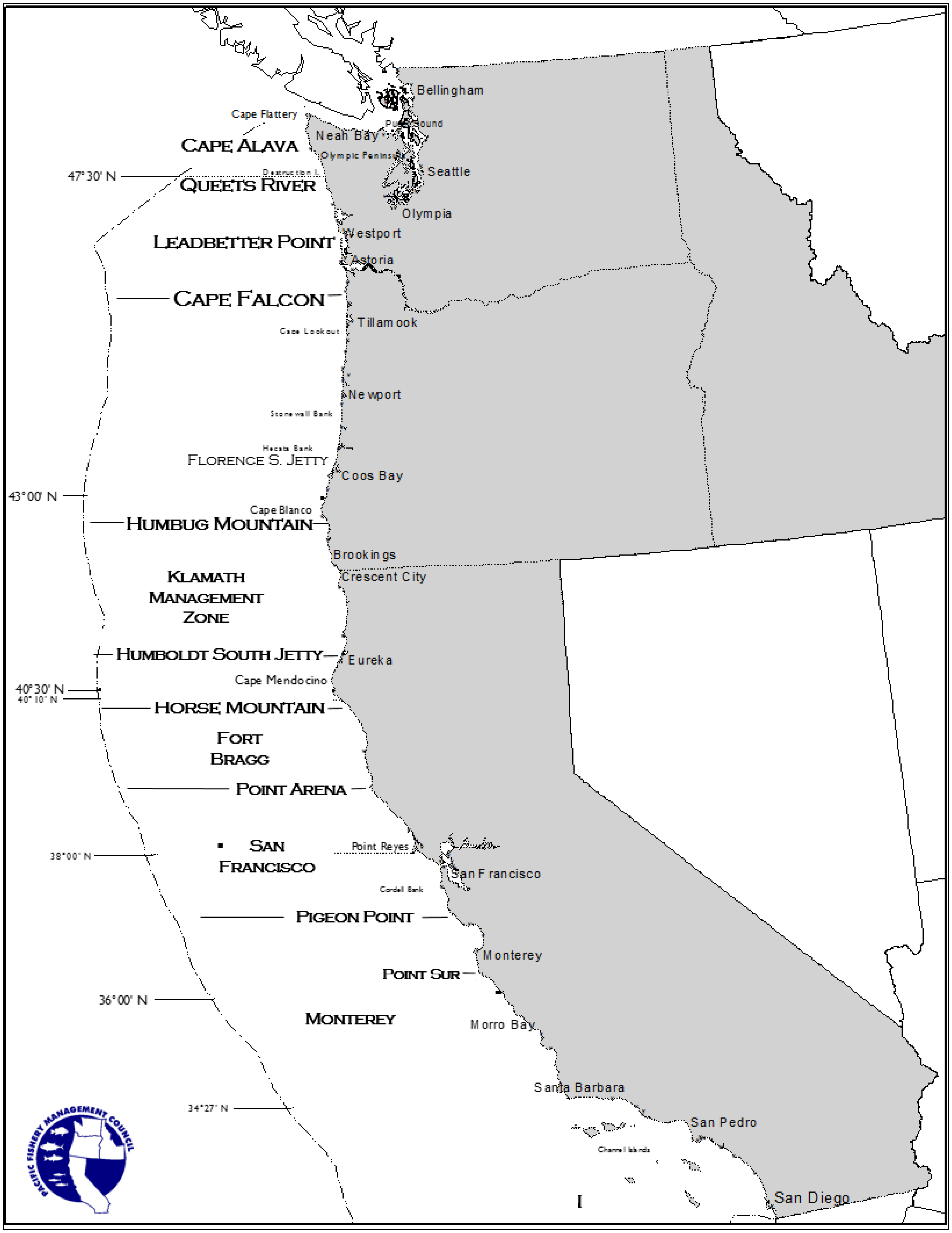
SSH - Sea surface height (South Beach, OR at 44º 37.5´ N, 124 º 02.6´ W)

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/ Forecast.



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