

**AMENDED
PRESEASON REPORT I
STOCK ABUNDANCE ANALYSIS
AND
ENVIRONMENTAL ASSESSMENT PART 1
FOR 2023 OCEAN SALMON FISHERY
REGULATIONS**

REGULATION IDENTIFIER NUMBER 0648-BL66



Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220-1384
(503) 820-2280
www.pcouncil.org

MARCH 2023
Amended APRIL 2024

Corrections to the initial report published in MARCH 2024 include:

- Table V-5: Sacramento River Fall Chinook exploitation rate value of 0.52 has been replaced with the correct value of 0.75.
- Table I-2 (page 2): Nooksack-Samish hatchery coho value updated from 49.2 to 66.6.
- Section 3.3 Puget Sound coho stocks: update the total value of Puget Sound coho from 742,673 to 760,032. Update the total hatchery component from 451,425 to 468,784.
- Section 3.3.2 Nooksack-Samish coho: update the hatchery value of 49,200 to 66,567.

ACKNOWLEDGMENTS

SALMON TECHNICAL TEAM

DR. MICHAEL O'FARRELL, CHAIR

National Marine Fisheries Service, Santa Cruz, California

MR. JON CAREY, VICE CHAIR

National Marine Fisheries Service, Lacey, Washington

DR. STEVE HAESEKER

U.S. Fish and Wildlife Service, Vancouver, Washington

DR. RICH ZABEL

National Marine Fisheries Service, Seattle, Washington

MS. GRACE EASTERBROOK (*alternate for Ms. Kandice Morgenstern*)

California Department of Fish and Wildlife, Eureka, California

MS. CASSANDRA LEEMAN (*alternate for Ms. Emily Shallow*)

Oregon Department of Fish and Wildlife, Salem, Oregon

MS. STEPHANIE THURNER (*alternate for Ms. Ashton Harp*)

Northwest Indian Fisheries Commission, Olympia, Washington

MR. KYLE VAN DE GRAAF (*alternate for Ms. Wendy Beeghley*)

Washington Department of Fish and Wildlife, Montesano, Washington

PACIFIC FISHERY MANAGEMENT COUNCIL STAFF

MS. ROBIN EHLKE

The Salmon Technical Team and the Council staff express their thanks for the expert assistance provided by Ms. Ranelle Reber, Ms. Erica Weyland, and Ms. Danielle Williams, Washington Department of Fish and Wildlife; Mr. Ian Pritchard, Mr. Lane Jackson, and Ms. Audrey Dean, California Department of Fish and Wildlife and numerous other tribal and agency personnel in completing this report.

This document may be cited in the following manner:

Pacific Fishery Management Council. 2023. *Preseason Report I: Stock Abundance Analysis and Environmental Assessment Part 1 for 2023 Ocean Salmon Fishery Regulations*. (Document prepared for the Council and its advisory entities.) Pacific Fishery Management Council, 7700 NE Ambassador Place, Suite 101, Portland, Oregon 97220-1384.



A report of the Pacific Fishery Management Council pursuant to National Oceanic and Atmospheric Administration Award Number FNA20NMF4410011.

TABLE OF CONTENTS

| | <u>Page</u> |
|---|-------------|
| INTRODUCTION | 1 |
| PURPOSE AND NEED | 1 |
| CHAPTER I: DESCRIPTION OF THE AFFECTED ENVIRONMENT | 3 |
| 1.1 ABUNDANCE FORECASTS | 4 |
| 1.2 ACCEPTABLE BIOLOGICAL CATCH, ANNUAL CATCH LIMITS, AND OVERFISHING LIMITS | 4 |
| 1.2.1 Acceptable Biological Catch..... | 5 |
| 1.2.2 Annual Catch Limit | 5 |
| 1.2.3 Overfishing Limit | 5 |
| 1.3 STATUS DETERMINATION CRITERIA | 5 |
| CHAPTER II: AFFECTED ENVIRONMENT - CHINOOK SALMON ASSESSMENT | 12 |
| 2.1 CHINOOK STOCKS SOUTH OF CAPE FALCON..... | 12 |
| 2.1.1 Sacramento River Fall Chinook..... | 12 |
| Predictor Description | 12 |
| Predictor Performance | 12 |
| Stock Forecast and Status | 13 |
| OFL, ABC, and ACL | 13 |
| 2.1.2 Sacramento River Winter Chinook..... | 13 |
| Predictor Description | 14 |
| Predictor Performance | 14 |
| Stock Forecast and Status | 14 |
| 2.1.3 Klamath River Fall Chinook..... | 14 |
| Predictor Description | 14 |
| Predictor Performance | 15 |
| Stock Forecast and Status | 15 |
| OFL, ABC, and ACL | 15 |
| 2.1.4 Other California Coastal Chinook Stocks..... | 16 |
| 2.1.5 Oregon Coast Chinook Stocks..... | 16 |
| Far-North and North Migrating Chinook (NOC and MOC groups) | 16 |
| Predictor Description | 16 |
| Predictor Performance | 17 |
| Stock Forecast and Status | 17 |
| South/Local Migrating Chinook (SOC group)..... | 17 |
| Predictor Description | 18 |
| Predictor Performance | 18 |
| Stock Forecast and Status | 18 |
| Other SOC Stocks | 18 |
| 2.2 CHINOOK STOCKS NORTH OF CAPE FALCON | 19 |
| 2.2.1 Columbia River Chinook..... | 19 |
| Predictor Description | 19 |
| Predictor Performance | 20 |
| Stock Forecasts and Status..... | 20 |
| 2.2.2 Washington Coast Chinook | 20 |
| Predictor Description and Past Performance | 21 |
| Stock Forecasts and Status..... | 21 |
| 2.2.3 Puget Sound Chinook | 21 |
| Predictor Description | 22 |
| Predictor Performance | 22 |
| Stock Forecasts and Status..... | 22 |
| Spring Chinook | 22 |

| | |
|---|----|
| Summer/Fall Chinook | 22 |
| 2.3 STOCK STATUS DETERMINATION UPDATES | 22 |
| 2.4 SELECTIVE FISHERY CONSIDERATIONS FOR CHINOOK | 23 |
| CHAPTER III - COHO SALMON ASSESSMENT | 48 |
| COLUMBIA RIVER AND OREGON/CALIFORNIA COAST COHO | 48 |
| 3.1 OREGON PRODUCTION INDEX AREA | 48 |
| 3.1.1 Hatchery Coho | 48 |
| Predictor Description | 48 |
| Predictor Performance | 49 |
| Stock Forecast and Status | 49 |
| 3.1.2 Oregon Coastal Natural Coho | 49 |
| Predictor Description | 49 |
| Predictor Performance | 51 |
| Stock Forecasts and Status | 51 |
| 3.1.3 Southern Oregon / Northern California Coast Coho | 51 |
| 3.1.4 Lower Columbia River Natural | 51 |
| Predictor Description | 51 |
| Predictor Performance | 52 |
| Stock Forecast and Status | 52 |
| 3.1.5 Oregon Production Index Area Summary of Forecasts | 52 |
| 3.2 WASHINGTON COAST COHO | 52 |
| 3.2.1 Willapa Bay | 52 |
| Predictor Description | 52 |
| Predictor Performance | 53 |
| Stock Forecasts and Status | 53 |
| OFL, ABC, and ACL | 53 |
| 3.2.2 Grays Harbor | 53 |
| Predictor Description | 53 |
| Predictor Performance | 54 |
| Stock Forecasts and Status | 54 |
| OFL | 54 |
| 3.2.3 Quinalt River | 54 |
| Predictor Description | 54 |
| Predictor Performance | 55 |
| Stock Forecasts and Status | 55 |
| 3.2.4 Queets River | 55 |
| Predictor Description | 55 |
| Predictor Performance | 55 |
| Stock Forecasts and Status | 55 |
| OFL | 55 |
| 3.2.5 Hoh River | 56 |
| Predictor Description | 56 |
| Predictor Performance | 56 |
| Stock Forecasts and Status | 56 |
| OFL | 56 |
| 3.2.6 Quillayute River | 56 |
| Predictor Description | 56 |
| Predictor Performance | 57 |
| Stock Forecasts and Status | 57 |
| 3.2.7 North Washington Coast Independent Tributaries | 58 |
| Predictor Description | 58 |
| Predictor Performance | 58 |

| | |
|--|----|
| Stock Forecasts and Status | 58 |
| 3.3 PUGET SOUND COHO STOCKS..... | 58 |
| 3.3.1 Strait of Juan de Fuca..... | 59 |
| Predictor Description | 59 |
| Predictor Performance | 59 |
| Stock Forecasts and Status..... | 59 |
| OFL | 59 |
| 3.3.2 Nooksack-Samish | 60 |
| Predictor Description | 60 |
| Predictor Performance | 60 |
| Stock Forecasts and Status..... | 60 |
| 3.3.3 Skagit | 60 |
| Predictor Description | 60 |
| Predictor Performance | 60 |
| Stock Forecasts and Status..... | 60 |
| OFL | 61 |
| 3.3.4 Stillaguamish | 61 |
| Predictor Description | 61 |
| Predictor Performance | 61 |
| Stock Forecasts and Status..... | 61 |
| OFL | 62 |
| 3.3.5 Snohomish | 62 |
| Predictor Description | 62 |
| Predictor Performance | 62 |
| Stock Forecasts and Status..... | 62 |
| OFL | 62 |
| 3.3.6 Hood Canal | 63 |
| Predictor Description | 63 |
| Predictor Performance | 63 |
| Stock Forecasts and Status..... | 63 |
| OFL | 63 |
| 3.3.7 South Sound..... | 63 |
| Predictor Description | 63 |
| Stock Forecasts and Status..... | 64 |
| 3.4 STOCK STATUS DETERMINATION UPDATES..... | 64 |
| 3.5 SELECTIVE FISHERY CONSIDERATIONS FOR COHO | 64 |
| CHAPTER IV: AFFECTED ENVIRONMENT - PINK SALMON ASSESSMENT..... | 76 |
| CHAPTER V: DESCRIPTION AND ANALYSIS OF THE NO-ACTION ALTERNATIVE | 77 |
| 5.1 ANALYSIS OF EFFECTS ON THE ENVIRONMENT OF THE NO-ACTION ALTERNATIVE..... | 77 |
| 5.1.1 Overview..... | 77 |
| 5.1.2 Sacramento River Fall Chinook..... | 77 |
| 5.1.3 Sacramento River Winter Chinook..... | 78 |
| 5.1.4 Klamath River Fall Chinook..... | 78 |
| 5.1.5 California Coastal Chinook Stocks..... | 78 |
| 5.1.6 Oregon Coast Chinook Stocks | 78 |
| 5.1.7 Columbia River Chinook Stocks | 78 |
| 5.1.8 Washington Coast and Puget Sound Chinook Stocks..... | 79 |
| 5.1.9 Oregon Production Index Area Coho Stocks..... | 79 |
| 5.1.10 Washington Coast, Puget Sound, and Canadian Coho Stocks..... | 79 |
| 5.1.11 Summary | 80 |
| 5.1.12 Conclusion | 80 |

| | |
|--|-----|
| REFERENCES | 103 |
| APPENDIX A SUMMARY OF COUNCIL STOCK MANAGEMENT GOALS | 104 |
| APPENDIX B SALMON HARVEST ALLOCATION SCHEDULES | 117 |
| APPENDIX C OREGON PRODUCTION INDEX DATA | 129 |
| APPENDIX D KLAMATH RIVER FALL CHINOOK ABUNDANCE FORECAST ANALYSIS..... | 134 |

LIST OF TABLES

| | <u>Page</u> |
|---|-------------|
| TABLE I-1. Preseason adult Chinook salmon stock forecasts in thousands of fish | 7 |
| TABLE I-2. Preseason adult coho salmon stock forecasts in thousands of fish | 10 |
| TABLE II-1. Harvest and abundance indices for adult Sacramento River fall Chinook (SRFC) in thousands of fish. | 24 |
| TABLE II-2. Sacramento River winter Chinook escapement, allowable age-3 impact rates, and management performance. | 26 |
| TABLE II-3. Klamath River fall Chinook ocean abundance (thousands), harvest rate, and river run size estimates (thousands) by age. (Page 1 of 2)..... | 27 |
| TABLE II-4. Comparisons of preseason forecast and postseason estimates for ocean abundance of adult Klamath River fall Chinook..... | 29 |
| TABLE II-5. Summary of management objectives and predictor performance for Klamath River fall Chinook | 33 |
| TABLE II-6. Harvest levels and rates of age-3 and age-4 Klamath River fall Chinook | 34 |
| TABLE II-7. Rogue River fall Chinook inriver run and ocean population indices | 38 |
| TABLE II-8. Predicted and postseason returns of Columbia River adult summer and fall Chinook in thousands of fish..... | 39 |
| TABLE II-9. Preseason forecasts and postseason estimates of Puget Sound run size for summer/fall Chinook in thousands of fish | 42 |
| TABLE III-1. Preliminary preseason and postseason coho stock abundance estimates for Oregon production index area stocks in thousands of fish | 65 |
| TABLE III-2. Oregon production index (OPI) area coho harvest impacts, spawning, abundance, and exploitation rate estimates in thousands of fish. | 67 |
| TABLE III-4. Preseason forecasts and postseason estimates of ocean abundance for selected Puget Sound adult natural coho stocks in thousands of fish ^{a/} | 70 |
| TABLE III-5. Status categories and constraints for Puget Sound and Washington Coast coho under the FMP and PST Southern Coho Management Plan. | 72 |
| TABLE III-6. Projected coho mark rates for 2023 U.S. forecasts under base period fishing patterns (percent marked). | 73 |
| TABLE IV-1. Estimated annual (odd-numbered years) run sizes and forecasts for Fraser River and Puget Sound pink salmon in millions of fish. | 76 |
| TABLE V-I. 2022 Commercial troll management measures for non-Indian ocean salmon fisheries - Council adopted..... | 82 |
| TABLE V-I. 2022 Commercial troll management measures for non-Indian ocean salmon fisheries - Council adopted..... | 87 |
| TABLE V-2. 2022 Recreational management measures for non-Indian ocean salmon fisheries - Council adopted. | 91 |
| TABLE V-3. 2022 Treaty Indian ocean troll management measures for ocean salmon fisheries - Council adopted. (Page 1 of 2) | 96 |
| TABLE V-4. Stock status relative to overfished and overfishing criteria. | 98 |
| TABLE V-5. Postseason S_{ACL} , S_{OFL} , and spawner escapement estimates for Sacramento River fall Chinook (SRFC), Klamath River fall Chinook (KRFC) and Willapa Bay coho. | 99 |

| | | |
|------------|--|-----|
| TABLE V-6. | Comparison of projected ocean escapements and exploitation rates for critical natural and Columbia River hatchery coho stocks (thousands of fish) resulting from application of 2022 Council-adopted regulations to 2022 and 2023 ocean abundance forecasts. | 100 |
| TABLE V-7. | Comparison of Lower Columbia natural (LCN), Oregon coastal natural (OCN), and Southern Oregon/Northern California Coastal (SONCC) coho projected harvest mortality and exploitation rates by fishery under Council-adopted 2022 regulations and preliminary 2023 preseason abundance estimates. | 101 |
| TABLE V-8 | Maximum allowable fishery impact rate for OCN coho under Amendment 13 matrix and the revised OCN work group matrix based on parent escapement levels by stock component and marine survival category. ^{a/} | 102 |

LIST OF FIGURES

| | <u>Page</u> |
|---|-------------|
| 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. | 45 |
| 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. | 45 |
| 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 | 46 |
| FIGURE II-4. Selected preseason vs. postseason forecasts for Chinook stocks with substantial contribution to Council area fisheries. | 47 |
| FIGURE III-1a. Selected preseason vs. postseason forecasts for coho stocks with substantial contribution to Council area fisheries. | 74 |
| FIGURE III-1b. Selected preseason vs. postseason forecasts for coho stocks with substantial contribution to Council area fisheries | 75 |

LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|-----------|--|
| ABC | acceptable biological catch |
| ACL | annual catch limit |
| BY | brood year |
| CCC | central California coast (coho) |
| CDFW | California Department of Fish and Wildlife |
| CoTC | Coho Technical Committee (of the PSC) |
| Council | Pacific Fishery Management Council |
| CRFMP | Columbia River Fishery Management Plan |
| CWT | coded-wire tag |
| EA | Environmental Assessment |
| EEZ | exclusive economic zone (from 3-200 miles from shore) |
| EIS | Environmental Impact Statement |
| EMAP | Environmental Monitoring and Assessment Program |
| ESA | Endangered Species Act |
| ESU | evolutionarily significant unit |
| F_{ABC} | exploitation rate associated with ABC |
| F_{ACL} | exploitation rate associated with ACL ($= F_{ABC}$) |
| FMP | fishery management plan |
| F_{MSY} | maximum sustainable yield exploitation rate |
| FNMC | Far-North-Migrating Coastal |
| F_{OFL} | exploitation rate associated with the overfishing limit ($= F_{MSY}$, MFMT) |
| FONSI | Finding of No Significant Impacts |
| FRAM | Fishery Regulatory Assessment Model |
| GAM | generalized additive models |
| ISBM | individual stock-based management |
| JA3 | January age-3 coho |
| Jack CR | Columbia River jacks (coho) |
| Jack OC | Oregon coastal and Klamath River Basin jacks (coho) |
| Jack OPI | Jack CR + Jack OC (coho) |
| KMZ | Klamath management zone (ocean zone between Humbug Mountain and Horse Mountain where management emphasis is on Klamath River fall Chinook) |
| KOHM | Klamath Ocean Harvest Model |
| KRFC | Klamath River fall Chinook |
| KRTT | Klamath River Technical Team |
| LCN | lower Columbia River natural (coho) |
| LCR | lower Columbia River (natural tule Chinook) |
| LRB | lower Columbia River bright (Chinook) |
| LRH | lower Columbia River hatchery (tule fall Chinook returning to hatcheries below Bonneville Dam) |
| LRW | lower Columbia River wild (bright fall Chinook spawning naturally in tributaries below Bonneville Dam) |
| MCB | Mid-Columbia River bright (bright hatchery fall Chinook released below McNary Dam) |
| MFMT | maximum fishing mortality threshold |
| MOC | mid-Oregon coast |
| MSA | Magnuson-Stevens Fishery Conservation and Management Act |
| MSM | mixed stock model |
| MSST | minimum stock size threshold |
| MSY | maximum sustainable yield |
| NA | not available |
| NEPA | National Environmental Policy Act |

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

| | |
|------------------|--|
| NMFS | National Marine Fisheries Service |
| NOC | north Oregon coast |
| NPGO | North Pacific Gyre Oscillation |
| NS1G | National Standard 1 Guidelines |
| OA3 | ocean age-3 coho |
| OCN | Oregon coast natural (coho) |
| OCNL | Oregon coast natural lake (coho) |
| OCNR | Oregon coast natural river (coho) |
| ODFW | Oregon Department of Fish and Wildlife |
| OFL | overfishing limit |
| OPI | Oregon Production Index (coho salmon stock index south of Leadbetter Point) |
| OPIH | Oregon Production Index public hatchery |
| OPITT | Oregon Production Index Technical Team |
| OY | Optimum Yield |
| PDO | Pacific Decadal Oscillation |
| PFMC | Pacific Fishery Management Council (Council) |
| PRIH | Private hatchery |
| PSC | Pacific Salmon Commission |
| PST | Pacific Salmon Treaty |
| RER | rebuilding exploitation rate |
| RK | Rogue/Klamath (coho) |
| RMP | Resource Management Plan (for exemption from ESA section 9 take prohibitions under limit 6 of the 4(d) rule) |
| ROPI | Rogue Ocean Production Index (Chinook) |
| SAB | Select Area brights (bright fall Chinook destined for Select Area sites on the lower Columbia River) |
| S _{ABC} | spawning escapement associated with ABC |
| S _{ACL} | spawning escapement associated with ACL (= S _{ABC}) |
| SCH | Spring Creek Hatchery (tule fall Chinook returning to SCH) |
| SHM | Sacramento Harvest Model |
| SI | Sacramento Index |
| SJF | Strait of Juan de Fuca |
| S _{MSY} | MSY spawning escapement |
| S _{OFL} | spawning escapement associated with the overfishing limit (= S _{MSY}) |
| SOC | south Oregon Coast |
| SONC | southern Oregon/northern California (Chinook) |
| SONCC | southern Oregon/northern California coast (coho) |
| 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 (<i>U.S. v. Oregon</i>) |
| URB | Upriver bright (naturally spawning bright fall Chinook primarily migrating past McNary Dam) |
| VSI | visual stock identification |
| WCVI | West Coast Vancouver Island |
| WDFW | Washington Department of Fish and Wildlife |

INTRODUCTION

This is the second report in an annual series of four reports prepared by the Salmon Technical Team (STT) of the Pacific Fishery Management Council (Council) to document and help guide ocean salmon fishery management off the coasts of Washington, Oregon, and California. This 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 2023 meeting. This report provides 2023 salmon stock abundance forecasts, and an analysis of the impact of 2022 management measures or regulatory procedures on the projected 2023 abundance. This analysis is intended to give perspective in developing 2023 management measures.

This report constitutes the first part of an Environmental Assessment (EA) to comply with National Environmental Policy Act (NEPA) requirements for the 2023 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 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. These reports (Preseason Report II and Preseason Report III) will analyze the impact 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 2023 ocean salmon fisheries, a description of the alternatives, and an analysis of the environmental consequences of the alternatives. Preseason Report II will also analyze the potential impacts of a reasonable range of alternatives, which will inform the final fishery management measures included in Preseason Report III. Preseason Report III will describe and analyze the effects of the Council's final proposed action, including cumulative effects. Together, these parts of the EA will provide the necessary components to determine if a finding of no significant impact (FONSI) or Environmental Impact Statement (EIS) is warranted.

Chapter I provides a summary of stock abundance forecasts. Chapters II and III provide detailed stock-by-stock analyses of abundance, a description of prediction methodologies, and accuracy of past abundance forecasts for Chinook and coho salmon, respectively. Chapter IV summarizes abundance and forecast information for pink salmon. Chapter V provides an assessment of 2022 regulations applied to 2023 abundance forecasts. Appendices provide supplementary information as follows: Appendix A provides a summary of Council stocks and their management objectives; Appendix B contains the Council's current harvest allocation schedules; and Appendix C contains pertinent data for Oregon Production Index (OPI) area coho. 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, development, and implementation of ocean salmon fishery management measures for the 2023,¹ 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 requirements developed by NMFS under ESA sections 4 and 7 for ESA-listed species (referred to in

¹ Annual management measures are effective beginning 16 May of the year they are implemented and generally continue through 15 May of the following year when they are replaced with the next year's measures. For ease of reference, we refer to the measures being developed for the 16 May 2023 -- 15 May 2024 fishing season as the 2023 management measures.

the FMP as “consultation standards”). In achieving this purpose, management measures must take into account the allocation of harvest among different user groups and port areas. Without this action, the 2022 management measures would remain in effect, which do not consider changes in abundance of stocks in the mixed stock ocean salmon fisheries or new or modified consultation standards. 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 tribal 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 10 National Standards set forth in the MSA.

Implementation of 2023 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 and consistent with the MSA.

The MSA includes 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 2023 fisheries.

CHAPTER I: DESCRIPTION OF THE AFFECTED ENVIRONMENT

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

The affected environment relevant to establishing the 2023 ocean salmon fishery management measures consists of the following components:

- Target Species – Non-ESA-listed Chinook, coho, and pink salmon
- ESA-listed salmon species that are incidentally caught in the ocean salmon fisheries
- Socioeconomic aspects of coastal communities, federally-recognized Tribes, and states
- Other non-target fish species – Pacific Halibut, groundfish
-
- Marine mammals – pinnipeds, killer whales
- Seabirds
- Biodiversity and ecosystem function
- Ocean and coastal habitats, ESA critical habitat, and Essential Fish Habitat (EFH)
- Public health or safety
- Unique characteristics of the geographic area
- Cultural, scientific, or historical resources such as those eligible for listing in the National Register of Historic Places

A description of the historical baseline for the components of the affected environment is presented in the Review of 2022 Ocean Salmon Fisheries (PFMC 2023). The current status (2023 ocean abundance forecasts) of the environmental components expected to be affected by the 2023 ocean salmon fisheries regulation alternatives (FMP salmon stocks, including those listed under the ESA) are described in this report (Part 1 of the 2023 salmon EA). The *Review of 2022 Ocean Salmon Fisheries* (PFMC 2023) 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 2022 NEPA process for ocean salmon regulations (Preseason Reports II and III; PFMC 2022b and 2022c). In those analyses, proposed management measures were determined to have no significant impacts the affected environment.

The 2023 No-Action Alternative is the same as the 2022 action, therefore it is expected to have no significant impacts in the absence of large changes to the affected environment. This document, therefore, does not reanalyze the No-Action Alternative's impact on most components of the affected environment. This document does, however, include analysis of the impacts of the No-Action Alternative on salmon stocks identified in the FMP, the component of the environment for which conditions have changed such that the effects in 2023 are different.

The component of the affected environment that is described in this document consists only of the salmon stocks identified in the FMP (Appendix A). The 2023 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 2023 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.

1.1 ABUNDANCE FORECASTS

Abundance forecasts for 2023 are summarized for key Chinook and coho salmon stocks in Tables I-1 and I-2, respectively. A cursory comparison of preseason forecast and postseason abundance estimates for selected stocks is presented in Figures II-2, 3, 4 and III-1. More detailed analyses of this subject are covered in Chapters II (Chinook) and III (coho). Information on pink salmon abundance and forecasts is contained in Chapter IV. Council Salmon FMP conservation objectives are presented in Appendix A; allocation objectives are presented in Appendix B.

In addition to the key stocks with abundance forecasts listed in Tables I-1 and I-2, Council management decisions for the 2023 ocean salmon fishing seasons may be constrained by other stocks, such as those listed under the ESA or subject to Pacific Salmon Commission (PSC) agreements, which may not have abundance forecasts made, or do not have abundance forecasts available in time for inclusion in this report. These include the following Evolutionarily Significant Units (ESUs): Central Valley Spring Chinook, California Coastal Chinook, Lower Columbia River (LCR) natural Chinook (tule component), Snake River Fall Chinook; Central California Coast coho, Southern Oregon/Northern California Coast coho, and Interior Fraser (including Thompson River) coho.

1.2 ACCEPTABLE BIOLOGICAL CATCH, ANNUAL CATCH LIMITS, AND OVERFISHING LIMITS

The Salmon FMP includes specification of ABC, ACLs, OFLs, and Scientific and Statistical Committee (SSC) recommendations for ABC.

Currently, ABC and ACLs specifications are required for three salmon stocks; Sacramento River fall Chinook (SRFC), which serve as an indicator stock for the Central Valley Fall Chinook complex, Klamath River fall Chinook (KRFC), which serve as an indicator stock for the Southern Oregon/Northern California Chinook complex, and Willapa Bay natural coho. Other stocks in the FMP are not required to have ACLs either because they were components of these two stock complexes, were ESA-listed, were hatchery stocks, or were managed under an international agreement.

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 National Standard 1 Guidelines (NS1Gs) state that ABCs are not required if stocks meet this international exception. The NS1Gs allow the flexibility to consider alternative approaches for specifying ACLs for stocks with unusual life history characteristics like Pacific salmon, and particularly for species listed under the ESA and hatchery stocks. For hatchery stocks, broodstock goals serve as conservation objectives rather than specifying ACLs. For ESA-listed stocks, biological opinions and associated consultation standards describe necessary controls to ensure their long-term conservation.

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

1.2.1 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.

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

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

1.2.2 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} .

1.2.3 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

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

1.3 STATUS DETERMINATION CRITERIA

The FMP includes status determination criteria (SDC) for overfishing, approaching an overfished condition, overfished, not overfished/rebuilding, and rebuilt. These criteria are:

- Overfishing occurs when a single year exploitation rate exceeds the maximum fishing mortality threshold (MFMT), which is based on the maximum sustainable yield exploitation rate (F_{MSY});
- Approaching an overfished condition occurs when the geometric mean of the two most recent postseason estimates of spawning escapement, and the current preseason forecast of spawning escapement, is less than the minimum stock size threshold (MSST);

- Overfished status occurs when the most recent 3-year geometric mean spawning escapement is less than the MSST;
- Not overfished/rebuilding status occurs when a stock has been classified as overfished and has not yet been rebuilt, and the most recent 3-year geometric mean spawning escapement is greater than the MSST but less than S_{MSY} ;
- A stock is rebuilt when the most recent 3-year geometric mean spawning escapement exceeds S_{MSY} .

Comparison of stock status to criteria for overfishing, overfished, not overfished/rebuilding, and rebuilt were reported in the annual SAFE document, Review of 2022 Ocean Salmon Fisheries (PFMC 2023). Approaching an overfished condition relies on current year preseason forecasts and Council adopted fishing regulations for the upcoming season in order to calculate projected spawning escapement. In this report, because the actual regulations for the upcoming season are not yet known, the calculations are based on preseason forecasts and Council-adopted regulations from the year prior. Thus, the stock status in this report is described as being *at risk* of approaching an overfished condition. Once the regulations for the upcoming season are adopted and spawning escapement is projected, the status description will be updated and provided in the Preseason-III report. All SDC rely on the most recent estimates available, which in some cases may be a year or more in the past because of incomplete broods or data availability; however, some status descriptions reported in the SAFE document may be updated if more recent spawning escapement or exploitation rate estimates become available between the time the SAFE document and this document are published.

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

| Production Source and Stock or Stock Group | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | Methodology for 2023 Prediction and Source |
|---|-------|-------|-------|-------|-------|-------|---|
| Sacramento River | | | | | | | |
| Fall (Sacramento Index) | 229.4 | 379.6 | 473.2 | 271.0 | 396.5 | 169.8 | Log-log regression of the Sacramento Index on jack escapement from the previous year, accounting for lag-1 autocorrelated errors. STT. |
| Winter (age-3 absent fishing) | 1.6 | 1.9 | 3.1 | 9.1 | 6.0 | 4.5 | Stochastic life cycle model applied to natural- and hatchery-origin production. STT. |
| Klamath River (Ocean Abundance) | | | | | | | |
| Fall | 359.2 | 274.2 | 186.6 | 181.5 | 200.1 | 103.8 | 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) | | | | | | | |
| Cowlitz Spring | 5.2 | 1.3 | 1.4 | 1.8 | 4.1 | 9.0 | Cowlitz, Kalama, and Lewis: Age-specific linear regressions of cohort returns in previous run years. WDFW. |
| Kalama Spring | 1.5 | 1.4 | 1.0 | 2.2 | 2.0 | 2.4 | |
| Lewis Spring | 3.7 | 1.5 | 1.4 | 2.4 | 2.4 | 4.7 | |
| Sandy Spring | 5.3 | 5.5 | 5.2 | 5.3 | 5.6 | 7.8 | Recent 3-year average. ODFW. |
| Willamette Spring | 53.8 | 40.2 | 40.8 | 50.1 | 51.2 | 71.0 | Age-specific linear regressions of cohort returns in previous run years. ODFW. Forecast includes adult fish only. |
| Upriver Spring ^{a/} | 166.7 | 99.3 | 81.7 | 75.2 | 122.9 | 198.6 | Columbia River Upriver Spring and Summer Chinook: AIC-weighted average of age-specific cohort ratios and sibling regression models. Columbia River TAC subgroup and WDFW. |
| Upriver Summer ^{b/} | 67.3 | 35.9 | 38.3 | 77.6 | 57.5 | 84.8 | |
| LRW Fall | 7.6 | 13.7 | 19.7 | 20.0 | 10.8 | 8.6 | Columbia River Fall Chinook: AIC-weighted average of age-specific cohort ratios and sibling regression models. Columbia River TAC subgroup and WDFW. |
| LRH Fall | 62.4 | 54.5 | 51.0 | 73.1 | 73.0 | 77.1 | |
| SCH Fall | 50.1 | 46.0 | 46.2 | 46.8 | 91.2 | 136.1 | |
| MCB Fall | 36.4 | 56.7 | 71.8 | 77.4 | 70.2 | 48.3 | |
| URB Fall | 200.1 | 158.4 | 233.4 | 354.2 | 230.4 | 272.4 | |

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

| Production Source and Stock or Stock Group | | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | Methodology for 2023 Prediction and Source |
|--|----------|------|------|------|------|------|------|--|
| Washington Coast | | | | | | | | |
| Willapa Bay Fall | Natural | 3.8 | 4.3 | 2.9 | 3.9 | 3.1 | 2.8 | Sibling and environmental relationships from recent year returns. |
| | Hatchery | 40.3 | 23.6 | 28.3 | 30.5 | 30.1 | 27.5 | Relationships between brood year survival and number of spawners. |
| Grays Harbor Fall | Natural | 16.4 | 18.0 | 15.0 | 15.5 | 17.9 | 15.0 | Combination of geometric mean of recent year returns and linear relationships of sibling recruits per spawner. |
| | Hatchery | 4.8 | 7.7 | 6.9 | 7.6 | 8.6 | 5.9 | Combination of recent year smolt return rates and log linear regressions of sibling returns per smolt. |
| Quinault Spring/Summer | Natural | NA | NA | NA | NA | NA | NA | |
| | Hatchery | 4.8 | NA | NA | NA | NA | NA | |
| Quinault Fall | Natural | 5.2 | 5.3 | 4.2 | 6.0 | 3.2 | 4.0 | Recent 5-year mean return rates, applied to brood year natural spawning escapements of age 3-6 returns. |
| | Hatchery | 3.1 | 2.7 | 4.5 | 4.9 | 5.6 | 7.6 | Recent 5-year mean terminal return rates (return/smolt release) for age 3-6 adult returns. |
| Queets Spring/Sum | Natural | 0.5 | 0.6 | 0.6 | 0.6 | 0.6 | 0.4 | Recent 5-year (2018-2022) mean terminal run size. |
| Queets Fall | Natural | 3.3 | 3.4 | 4.1 | 4.3 | 5.3 | 4.3 | Recent 5-year return/spawner rates. |
| | Hatchery | 0.6 | 0.8 | 0.7 | 0.6 | 0.5 | 0.8 | Recent year rates (return/smolt release) adjusted by brood performance. |
| Hoh Spring/Summer | Natural | 1.1 | 1.0 | 0.8 | 1.0 | 0.7 | 1.0 | Spring/Summer: 5-year mean recruit/spawner rates. |
| Hoh Fall | Natural | 2.6 | 2.5 | 2.6 | 2.6 | 3.4 | 2.6 | Fall: Recent 3-year mean recruit/spawner adjusted by previous performance. |
| Quillayute Spring | Hatchery | 2.1 | 2.1 | 2.4 | 2.6 | 3.0 | 2.8 | Spring: Recent 2-year mean returns per smolt. |
| Quillayute Sum/Fall | Natural | 8.0 | 7.9 | 9.8 | 9.6 | 8.8 | 11.3 | Summer/Fall: Recent 5-year mean for all ages. Fall: Recent 3-year mean return/spawner. |
| Hoko ^{c/} | Natural | 1.5 | 2.8 | 2.6 | 1.3 | 0.9 | 2.8 | Escapement without fishing, includes supplemental. Sibling regressions using data from return years 1989-2022. |
| North Coast Totals | | | | | | | | |
| Spring/Summer | Natural | 1.6 | 1.7 | 1.4 | 1.5 | 1.3 | 1.4 | |
| Fall | Natural | 19.1 | 19.2 | 20.6 | 22.5 | 20.7 | 22.1 | |
| Spring/Summer | Hatchery | 2.1 | 2.1 | 2.4 | 2.6 | 3.0 | 2.8 | |
| Fall | Hatchery | 3.7 | 3.5 | 5.2 | 5.5 | 6.1 | 8.4 | |

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

| Production Source and Stock or Stock Group | | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | Methodology for 2023 Prediction and Source |
|---|----------|-------|------|-------|------|------|------|--|
| Puget Sound summer/fall^{d/} | | | | | | | | |
| Nooksack/Samish | Hatchery | 24.6 | 21.3 | 18.2 | 18.9 | 28.1 | 41.2 | Three year average return rate. |
| East Sound Bay | Hatchery | 0.7 | 0.3 | 0.3 | 0.6 | 0.4 | 0.2 | Three year average return rate. |
| Skagit | Natural | 13.3 | 13.6 | 12.9 | 10.5 | 12.5 | 12.2 | Natural: Hierarchical Bayesian model to estimate the spaw ner-recruit dynamics. Hatchery: One year ahead forecasts generated using Chinook run sizes and GAM and ARIMA models. |
| | Hatchery | 0.3 | 0.3 | 0.5 | 0.5 | 0.5 | 0.5 | |
| Stillaguamish ^{e/} | Natural | 1.6 | 0.9 | 0.9 | 0.9 | 0.9 | 1.2 | Natural plus hatchery. Multiple regression environmental model (Environmental Model to Predict Adult Returns, EMPAR). |
| Snohomish ^{e/} | Natural | 3.5 | 3.2 | 3.0 | 2.9 | 2.4 | 3.4 | Natural fingerling: Multiple regression environmental model (EMPAR). Natural yearling: Naïve models using the ForecastR tool (Vélez-Espino et al. 2018; https://solv-code.shinyapps.io/forecastr/). |
| | Hatchery | 6.5 | 7.0 | 6.8 | 6.1 | 6.0 | 7.5 | Average brood survival by age and juvenile rearing type (yearling and sub-yearling), of recent 3 complete brood returns (2015 - 2017), |
| Tulalip ^{e/} | Hatchery | 7.5 | 12.5 | 6.0 | 5.8 | 7.7 | 5.5 | Multiple regression environmental model (EMPAR). |
| South Puget Sound | Natural | 4.8 | 8.4 | 5.8 | 7.0 | 6.9 | 7.0 | Natural: Lake Washington; 4-yr avg recruit per spaw ner for age 3, 4-yr avg sibling ratios for ages 4 & 5. Green; 3-yr average return rates. Puyallup; climate relationship for age 3, 5-yr average return per spaw ner for ages 4-5. Nisqually; smolt to adult pow er for age 3, sibling relationship age 4, 3-yr smolt to adult age 5. Hatchery: Variety of recent year average return rates or sibling relationships. |
| | Hatchery | 123.6 | 99.9 | 100.7 | 78.8 | 90.3 | 90.4 | |
| Hood Canal | Natural | 3.9 | 1.2 | 4.6 | 5.7 | 5.4 | 3.2 | Includes hatchery strays to spaw ning grounds in Skokomish River. Proportioned using Hood Canal terminal run reconstruction-based relative contribution of the individual management units for 2018-2022 return years. Area 12B returns derived by applying an average proportion of natural origin recruits returning to area 12B for 2018-2022. |
| | Hatchery | 57.6 | 66.0 | 67.6 | 64.1 | 51.9 | 53.6 | |
| Strait of Juan de Fuca Including Dungeness spring run | Natural | 6.0 | 8.3 | 5.0 | 5.5 | 5.0 | 3.7 | Natural and hatchery. Dungeness and Elwha hatchery estimated by all year mean return/release rates. Dungeness wild estimated by smolts times all year mean return rate. Elwha wild estimated using 12 year hatchery/wild breakouts from otolith and CWT. |

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

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

c/ Expected spaw ning escapement w ithout fishing.

d/ Unless otherw ise noted, Puget Sounds forecasts are in units of terminal run size.

e/ Includes a mixture of runsize types including escapement w ithout fishing and terminal run. 2023 values are terminal runsize.

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

| Production Source and Stock or Stock Group | | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | Methodology for 2023 Prediction and Source |
|---|----------|-------|---------|-------|---------|---------|---------|--|
| OPI Area Total Abundance (California, Oregon Coasts, and Columbia River) | | 349.0 | 1,009.6 | 268.7 | 1,732.9 | 1,225.9 | 1,135.7 | 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 | 294.1 | 933.5 | 185.7 | 1607.9 | 1003.5 | 896.9 | OPIH: Columbia River jacks adjusted for delayed smolt releases and total OPI jacks regressed on 1970-2022 adults. Columbia/Coastal proportions based on jacks; Columbia early/late proportions based on jacks; Coastal N/S proportions based on smolts. |
| Columbia River Early | | 164.7 | 545.0 | 130.7 | 1014.0 | 592.5 | 481.8 | |
| Columbia River Late | | 121.5 | 360.6 | 50.3 | 576.0 | 404.7 | 404.3 | |
| Coastal N. of Cape Blanco | | 3.3 | 12.0 | 2.4 | 6.4 | 1.9 | 3.0 | |
| Coastal S. of Cape Blanco | | 4.6 | 15.9 | 2.3 | 11.5 | 4.4 | 7.8 | |
| Lower Columbia River | Natural | 21.9 | 36.9 | 24.8 | 39.2 | 65.7 | 45.5 | Oregon: recent three year average return; Washington: natural smolt production multiplied by 2020 brood marine survival rate. Abundance is subset of early/late hatchery abundance above. |
| Oregon Coast (OCN) | Natural | 54.9 | 76.1 | 83.0 | 125.0 | 222.4 | 238.8 | Rivers: Generalized additive model (GAM) relating ocean recruits to parental spawners and marine environmental variables. See text in Chapter III for details. Lakes: recent three year average abundance. |
| Washington Coast | | | | | | | | |
| Willapa | Natural | 20.6 | 63.4 | 17.9 | 19.0 | 35.8 | 42.7 | Washington Coast stocks: A variety of methods were used for 2022, primarily based on smolt production and survival. See text in Chapter III for details. |
| | Hatchery | 44.5 | 94.0 | 51.8 | 61.6 | 74.7 | 111.0 | |
| Grays Harbor | Natural | 42.4 | 71.5 | 50.0 | 44.8 | 120.4 | 102.8 | |
| | Hatchery | 51.4 | 64.3 | 42.3 | 31.7 | 78.3 | 111.4 | |
| Quinault | Natural | 25.4 | 13.9 | 17.5 | 15.0 | 19.4 | 23.6 | |
| | Hatchery | 29.6 | 26.9 | 27.0 | 24.6 | 42.7 | 30.6 | |
| Queets | Natural | 7.0 | 11.1 | 7.8 | 3.9 | 18.2 | 12.4 | |
| | Hatchery | 10.8 | 13.2 | 10.9 | 11.8 | 22.2 | 14.9 | |
| Hoh | Natural | 5.8 | 7.0 | 4.2 | 3.0 | 4.7 | 6.5 | |

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

| Production Source and Stock or Stock Group | | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | Methodology for 2023 Prediction and Source |
|--|-----------------|--------------|--------------|--------------|--------------|--------------|--------------|--|
| Quillayute Fall | Natural | 10.6 | 14.7 | 9.2 | 7.5 | 12.5 | 13.5 | For all Washington Coast stocks: A variety of methods were used for 2022, primarily based on smolt production and survival. See text in Chapter III for details. |
| | Hatchery | 16.5 | 17.0 | 13.0 | 15.1 | 20.3 | 19.1 | |
| Quillayute Summer | Natural | 2.7 | 1.2 | 0.8 | 0.3 | 0.9 | 1.6 | |
| | Hatchery | 3.3 | 3.4 | 3.4 | 3.4 | 4.6 | 3.9 | |
| North Coast Independent Tributaries | Natural | 4.1 | 8.1 | 5.1 | 4.7 | 18.0 | 13.5 | For all Puget Sound stocks: A variety of methods were used for 2022, 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 | 7.9 | 12.5 | 1.3 | 0.1 | 0.1 | 11.8 | |
| <i>WA Coast Total</i> | <i>Natural</i> | <i>118.7</i> | <i>191.0</i> | <i>112.4</i> | <i>98.4</i> | <i>229.8</i> | <i>216.6</i> | |
| | <i>Hatchery</i> | <i>164.1</i> | <i>231.3</i> | <i>149.6</i> | <i>148.2</i> | <i>243.0</i> | <i>302.7</i> | |
| Puget Sound | | | | | | | | |
| Strait of Juan de Fuca | Natural | 7.2 | 8.8 | 7.5 | 6.7 | 7.3 | 15.6 | |
| | Hatchery | 10.6 | 16.8 | 20.6 | 12.5 | 12.7 | 21.8 | |
| Nooksack-Samish | Natural | 20.6 | 25.1 | 15.4 | 35.3 | 36.0 | 29.5 | |
| | Hatchery | 61.3 | 59.8 | 42.5 | 54.6 | 73.8 | 66.6 | |
| Skagit | Natural | 59.2 | 57.9 | 31.0 | 58.4 | 80.4 | 43.1 | |
| | Hatchery | 13.1 | 9.9 | 18.2 | 22.0 | 21.3 | 21.1 | |
| Stillaguamish | Natural | 19.0 | 23.8 | 19.5 | 26.8 | 24.9 | 30.2 | |
| | Hatchery | 0.0 | 2.2 | 2.3 | 4.0 | 1.9 | 1.7 | |
| Snohomish | Natural | 65.9 | 62.6 | 39.0 | 60.0 | 64.2 | 76.5 | |
| | Hatchery | 38.3 | 43.7 | 26.6 | 29.9 | 22.6 | 64.0 | |
| South Sound | Natural | 15.0 | 30.4 | 7.3 | 27.5 | 31.0 | 58.3 | |
| | Hatchery | 103.0 | 180.4 | 164.0 | 192.7 | 208.5 | 218.8 | |
| Hood Canal | Natural | 59.5 | 40.1 | 35.0 | 28.8 | 20.2 | 37.9 | |
| | Hatchery | 84.5 | 87.9 | 72.2 | 55.7 | 61.4 | 74.8 | |
| <i>Puget Sound Total</i> | <i>Natural</i> | <i>246.4</i> | <i>248.8</i> | <i>154.6</i> | <i>243.5</i> | <i>264.0</i> | <i>291.2</i> | |
| | <i>Hatchery</i> | <i>310.8</i> | <i>400.7</i> | <i>346.3</i> | <i>371.4</i> | <i>402.3</i> | <i>468.8</i> | |

CHAPTER II: AFFECTED ENVIRONMENT - CHINOOK SALMON ASSESSMENT

2.1 CHINOOK STOCKS SOUTH OF CAPE FALCON

2.1.1 Sacramento River Fall Chinook

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

Predictor Description

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

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

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

$$\log SI_t = \beta_0 + \beta_1 \log J_{t-1} + \rho \varepsilon_{t-1},$$

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

$$SI_t = e^{\log SI_t}.$$

In prior years the SI forecast was expressed as a mean by the addition of a bias correction factor ($0.5\sigma^2$) to the $\log SI_t$ when transforming to the arithmetic scale (σ^2 is the variance of the normally distributed error component of the fitted model, referred to as the “innovation” variance). Beginning in 2023 the SI forecast will be expressed as the arithmetic scale median, reflecting a methodology change made following the 2023 Salmon Methodology Review.

A more detailed description of the general forecast approach can be found in Appendix E of the 2014 Preseason Report I (PFMC 2014).

Predictor Performance

The performance of past SI forecasts is displayed graphically in Figure II-4. For 2022, the preseason forecast of the SI (396,458) was 158 percent of the postseason estimate (251,191).

A control rule, adopted as part of Amendment 16 to the salmon FMP, is used annually to specify the maximum allowable exploitation rate on SRFC (Appendix A, Figure A-1). The allowable exploitation rate is determined by the predicted number of potential adult spawners in the absence of fisheries, which is defined for SRFC as the forecast SI. The FMP allows for any ocean and river harvest allocation that meets the exploitation rate constraints defined by the control rule. The regulations adopted in 2022 were expected to result in 198,694 hatchery and natural area adult spawners and an exploitation rate of 49.9 percent. Postseason estimates of these quantities were 61,851 hatchery and natural area adult spawners and an exploitation rate of 75.4 percent (Table II-1).

Stock Forecast and Status

Sacramento Index forecast model parameters were estimated from SI data for years 1983-2022 and jack escapement data for years 1982-2021. A total of 6,996 SRFC jacks were estimated to have escaped to Sacramento River basin hatcheries and natural spawning areas in 2022. This jack escapement and the estimated parameters

$$\begin{aligned}\beta_o &= 7.457462, \\ \beta_1 &= 0.554893, \\ \rho &= 0.7526451, \\ \epsilon_{t-1} &= -0.4355333, \\ \sigma^2 &= 0.1403361,\end{aligned}$$

result in a 2023 SI forecast of 169,767.

Figure II-2 graphically displays the 2023 SI forecast. The model fit (line in Figure II-2) was higher than the 2022 postseason estimate of the SI. As a result, the 2023 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 28.1 percent which produces, in expectation, 122,000 hatchery and natural area adult spawners. Therefore, fisheries impacting SRFC must be crafted to achieve, in expectation, a minimum of 122,000 adult spawners in 2023.

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 $S_{OFL} = 169,767 \times (1-0.78) = 37,349$. 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 $S_{ABC} = 169,767 \times (1-0.70) = 50,930$, with $S_{ACL} = S_{ABC}$. These preseason estimates will be recalculated with postseason abundance estimates (when available) to assess ACL and OFL compliance.

2.1.2 Sacramento River Winter Chinook

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

The first component of the consultation standard is the season and size limit provisions that have been in place since the 2004 Biological Opinion. These provisions state that the recreational salmon fishery between Point Arena and Pigeon Point shall open no earlier than the first Saturday in April and close no later than the second Sunday in November. The recreational salmon fishery between Pigeon Point and the

U.S.– Mexico Border shall open no earlier than the first Saturday in April and close no later than the first Sunday in October. The minimum size limit shall be at least 20 inches total length. The commercial salmon fishery between Point Arena and the U.S.–Mexico border shall open no earlier than May 1 and close no later than September 30, with the exception of an October fishery conducted Monday through Friday between Point Reyes and Point San Pedro, which shall end no later than October 15. The minimum size limit shall be at least 26 inches total length.

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

Predictor Description

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

Predictor Performance

The forecast of SRWC age-3 escapement absent fishing was implemented for the first time in 2018. Postseason estimates are not available.

Stock Forecast and Status

The forecast of SRWC age-3 escapement absent fishing is 4,540, with 39 percent of the forecast comprised of natural-origin fish. Over years 2018-2022, the average proportion natural for the SRWC forecast was 76 percent. Application of the control rule results in a maximum age-3 impact rate of 20.0 percent for the area south of Point Arena in 2023 (Table II-2).

.

2.1.3 Klamath River Fall Chinook

Predictor Description

For KRFC, 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 coded wire tag (CWT) information. 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.

The KRFC age-specific abundance forecasts have been made using all complete (or nearly complete) brood years since the 1979 brood. However, recent work suggests that using a more contemporary set of brood years to inform abundance forecasts resulted in better forecast performance. In particular, a recent investigation of this issue found that limiting data to a moving window of the 10 most recent complete (or nearly complete) brood years resulted in the best performance among the alternatives considered. A memo

summarizing and augmenting that work was presented to the Klamath River Technical Team (KRTT) at their January 2023 meeting (see Appendix D of this report). KRTT members supported use of the 10 brood year moving window for forecasting KRFC in 2023. The forecasts presented in this report are therefore based on the 10 brood year moving window data range.

Predictor Performance

The performance of past KRFC forecasts is displayed in Table II-4 and in Figure II-4. For 2022, the preseason forecast of the KRFC total adult abundance (200,117) was 99 percent of the postseason estimate (201,426).

Management of KRFC harvest since 1986 has attempted to achieve specific harvest rates on fully-vulnerable age-4 and age-5 fish in ocean and river fisheries (Table II-5). The Council has used a combination of quotas and time/area restrictions in ocean fisheries in an attempt to meet the harvest rate objective set each year. Since 1992, fisheries have been managed to achieve 50/50 allocation between tribal and non-tribal fisheries. Tribal and recreational river fisheries have been managed on the basis of adult Chinook quotas.

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

The 2022 salmon fishery regulations were expected to result in 38,180 natural-area spawning adults and an age-4 ocean harvest rate of 10.0 percent. Postseason estimates of these quantities were 22,051 natural-area adult spawners and an age-4 ocean harvest rate of 38.2 percent (Table II-5 and Table II-6).

Stock Forecast and Status

The 2023 forecast for the ocean abundance of KRFC as of September 1, 2022 (preseason) is 75,256 age-3 fish, 27,198 age-4 fish, and 1,339 age-5 fish.

Late-season commercial ocean fisheries in 2022 (September through November) were estimated to have harvested zero KRFC. Late-season recreational fisheries were estimated to have harvested 68 KRFC, all of which were age-4. This fall harvest equates to a 0.25 percent age-4 ocean harvest rate, which will be deducted from the ocean fishery's allocation in determining the 2023 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 2023 KRFC potential spawner abundance forecast is 26,238 natural-area adults. This potential spawner abundance forecast applied to the KRFC control rule results in an allowable exploitation rate of 10.0 percent, which produces, in expectation, 23,614 natural-area adult spawners. Therefore, fisheries impacting KRFC must be crafted to achieve, in expectation, a minimum of 23,614 natural-area adult spawners in 2023.

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 $26,238 \times (1 - 0.71) = 7,609$. 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 $S_{ABC} = 26,238 \times (1 - 0.68) = 8,396$, with $S_{ACL} = S_{ABC}$. These preseason estimates will be recalculated with postseason abundance estimates (when available) to assess ACL and OFL compliance.

2.1.4 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, Mad, Eel, Mattole, and Russian Rivers, and Redwood Creek. Except for the Smith River, these populations 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, as estimated postseason, to limit impacts on these stocks. In 2022, the age-4 ocean harvest rate was estimated to be 38.2 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.

2.1.5 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). Once available, forecast data for the NOC and MOC are incorporated into Chinook FRAM and used in the annual development of Council area fishery regulations. These forecasts are also used in the PSC management process and to inform terminal area management actions. Quantitative forecasts of abundance are based on sibling regression analyses from individual basins' escapement assessment data and scale sampling, which occur coastwide.

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 and reported in the annual Review of Ocean Salmon Fisheries (PFMC 2023, 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, and Elk rivers.

Basin-specific forecasts contribute an additive total to 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

Predictors for NOC and MOC stocks are evaluated annually by the PSC's Chinook Technical Committee.

Stock Forecast and Status

2.1.5.1.1 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 2022 NOC density from standard survey areas (Nehalem R. through the Siuslaw R.) was an increase from 2021 (PFMC 2022, Appendix B, Table B-11).

Based on the density index of total spawners, the generalized expectation for NOC stocks in 2023 is slightly above the recent five years' average density of 105 spawners per mile. Specifically, the 2022 spawner density in standard survey areas for the NOC averaged 106 spawners per mile, the second highest since 2017.

2.1.5.1.2 Mid Oregon Coast

Since 1977, the Elk River Hatchery production has been tagged for potential use as a PSC indicator stock for the MOC stock aggregate. Beginning in 2019, Elk River Hatchery production was included as a PSC indicator stock. Age-specific ocean abundance forecasts for 2023 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; however, the PSC has, and those findings and recommendations are published in the PSC Technical Report No. 35.

The 2022 MOC density from standard survey areas (Coos and Coquille basins) averaged 94 adult spawners per mile, an increase from 2021 (PFMC 2023, 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.

2.1.5.1.3 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 2022 Huntley Park escapement estimate and the resulting 2023 ROPI forecast of 218,300 consists of age-3 (185,800), age-4 (26,900) and age-5-6 (5,600) 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 2023 ROPI is the smallest value since 2016 (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 2022 average density from standard survey areas was 19 adult spawners per mile, a slight decrease from 2021 (PFMC 2023 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 2023, Appendix B, Table B-10, Chapter II, Table II-5, and Figure II-3).

2.2 CHINOOK STOCKS NORTH OF CAPE FALCON

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

Upper Columbia River summer Chinook also contribute to Council area fisheries, although like URB and LRW, most ocean impacts occur in British Columbia (B.C.) and Southeast Alaska (SEAK) fisheries. Upper Columbia River summer Chinook have both natural and hatchery components and originate in areas upstream from Rock Island Dam.

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

Predictor Description

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

The 2023 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 2022 Ocean Salmon Fisheries* (Appendix B, Tables B-15 through B-20). The 2022 returns for summer Chinook and the five fall Chinook stocks listed in this report may differ somewhat from those provided in the *Review of 2022 Ocean Salmon Fisheries* (PFMC 2023), 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). For 2022, the March preliminary preseason forecasts as a percentage of the postseason estimates are 91 percent for URB, 116 percent for LRW, 83 percent for LRH, 35 percent for SCH, 115 percent for MCB, and 73 percent for upper Columbia summer Chinook.

Stock Forecasts and Status

LRW fall Chinook: The preliminary forecast for 2023 ocean escapement of LRW fall Chinook is 8,600 adults, about 45 percent of the recent 10-year average return of 19,100. The forecast is about 92 percent of last year's actual return of 9,375. The spawning escapement goal of 5,700 in the North Fork Lewis River is expected to be achieved this year.

LRH fall Chinook: The 2023 preliminary forecast for ocean escapement of LRH fall Chinook is 77,100 adults, about 88 percent of last year's return of 87,542 and 94 percent of the recent 10-year average return of 82,000. Based on this abundance forecast, the total allowable LCR natural tule exploitation rate for 2023 fisheries is no greater than 38.0 percent under the matrix developed by the Tule Chinook Workgroup in 2011, which is used by NMFS in developing ESA guidance for this stock (Appendix A Table A-6).

SCH fall Chinook: The 2023 preliminary forecast for ocean escapement of SCH fall Chinook is 136,100 adults, about 53 percent of last year's return of 258,271 and 149 percent of the 10-year average of 91,200.

MCB fall Chinook: The 2023 preliminary forecast for ocean escapement of MCB fall Chinook is 48,300 adults, about 75 percent of last year's return of 64,622 and about 43 percent of the recent 10-year average of 107,600.

Summer Chinook: The 2023 preliminary forecast for ocean escapement of summer Chinook is 84,800 adults, about 108 percent of last year's return of 78,494 and about 120 percent of the recent 10-year average of 70,900. This ocean escapement forecast should provide opportunity for both ocean and in-river fisheries while exceeding the FMP S_{MSY} conservation objective of 12,143 escapement above Rock Island Dam.

URB fall Chinook: The 2023 preliminary forecast for ocean escapement of URB fall Chinook is 272,400 adults, about 107 percent of last year's return of 254,880 and about 66 percent of the recent 10-year average of 412,300. This forecasted ocean escapement should allow for moderate ocean and in-river fisheries while achieving the FMP S_{MSY} conservation objective of 39,625 natural area spawners in the Hanford Reach, Yakima River, and areas above Priest Rapids Dam.

Snake River wild fall Chinook: The 2023 preliminary forecast for ocean escapement of ESA-listed Snake River wild fall Chinook is 13,300 adults.

2.2.2 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 2023 Willapa Bay natural fall Chinook terminal runsize forecast is 2,833, which is below the FMP S_{MSY} conservation objective of 3,393. The hatchery fall Chinook terminal runsize forecast is 27,488.

The 2023 Grays Harbor spring Chinook terminal runsize forecast is 1,232, which is below the FMP S_{MSY} conservation objective of 1,400. The natural fall Chinook terminal runsize forecast is 15,006, which is above the FMP S_{MSY} conservation objective of 13,326. The fall hatchery terminal runsize forecast is 5,922.

The 2023 Quinault River natural fall Chinook terminal runsize forecast is 3,966. The fall hatchery terminal runsize forecast is 7,612.

The 2023 Queets River spring Chinook terminal runsize forecast is 383. The FMP S_{MSY} conservation objective is 700. The natural fall Chinook terminal runsize forecast is 4,269, which is above the FMP S_{MSY} conservation objective of 2,500. The fall hatchery terminal runsize forecast is 793.

The 2023 Hoh River natural spring/summer Chinook spawning escapement forecast is 1,045, which is above the FMP S_{MSY} conservation objective of 900. The natural fall Chinook forecast is 2,599, which is above the FMP S_{MSY} conservation objective of 1,200.

The 2023 Quillayute River hatchery spring Chinook ocean escapement forecast is 2,812. The natural summer Chinook forecast is 1,314, which is above the FMP S_{MSY} conservation objective of 1,200 summer Chinook. The fall Chinook forecast is 9,946, which is above the FMP S_{MSY} conservation objectives of 3,000 fall Chinook.

The 2023 Hoko River forecast is for an escapement without fishing of 2,808, which is above the FMP S_{MSY} conservation objective of 850.

2.2.3 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 consists of numerous natural Chinook stocks of small to medium-sized populations and substantial hatchery production. The Puget Sound ESU was listed under the ESA as threatened in March 1999.

Council-area fishery impacts to Puget Sound Chinook stocks are generally very low, on the order of five percent or less. NMFS issued a biological opinion in 2004 concluding that Council-area fisheries were not likely to jeopardize listed Puget Sound Chinook and exempting these fisheries from the ESA section 9 take prohibition as long as they are consistent with the terms and conditions in the opinion's incidental take

statement. This opinion does not cover the state-managed Puget Sound fisheries. In recent years, the comanagers have developed annual fishery management plans for Puget Sound and NMFS has issued one-year biological opinions for these plans exempting them from ESA section 9 take prohibitions. These opinions take into account the combined impacts of ocean and Puget Sound fisheries. Puget Sound stocks contribute to fisheries off B.C., are present to a lesser degree off SEAK, and are impacted to a minor degree by Council-area ocean fisheries. Because Council-area fishery impacts to Puget Sound Chinook stocks are minor, ocean regulations are not generally used to manage these stocks.

Predictor Description

Methodologies for estimates are described in the annual Puget Sound management reports (starting in 1993, reports are available by Puget Sound management unit, not by individual species). Forecasts for Puget Sound stocks generally assume production is dominated by age-4 adults. The STT has not undertaken a review of the methods employed by state and tribal staffs in preparing these abundance forecasts. Run-size expectations for various Puget Sound stock management units are listed in Table I-1.

Predictor Performance

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

Stock Forecasts and Status

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

Spring Chinook

Puget Sound Spring Chinook abundances remain depressed.

Summer/Fall Chinook

The 2023 preliminary natural Chinook return forecast is 30,700 (includes supplemental hatchery forecasts) and the preliminary hatchery Chinook return forecast is 198,900. The 2022 preseason natural Chinook return forecast was 33,200 (includes supplemental hatchery forecasts) and the hatchery Chinook return forecast was 185,000.

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

2.3 STOCK STATUS DETERMINATION UPDATES

Sacramento River fall Chinook and Klamath River fall Chinook were found to meet the criteria for being classified as overfished in the PFMC *Review of 2017 Ocean Salmon Fisheries*, released in February 2018. NMFS subsequently published an overfished designation for both stocks in June 2018, and rebuilding plans were developed for both and adopted by the Council in 2019. Queets River spring/summer Chinook were found to meet the criteria for being classified as overfished in the PFMC *Review of 2022 Ocean Salmon Fisheries*, released in February 2023.

Sacramento River fall Chinook was determined to be rebuilt in 2021. Based on the most recent three-year geometric mean escapement (2019-2021) published in the PFMC *Review of 2021 Ocean Salmon Fisheries*, Klamath River fall Chinook continues to meet the criteria for overfished status.

2.4 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. Since 2015, no mark-selective fisheries for Chinook in Council waters have occurred. For 2023 preseason planning, selective fishing options for non-Indian fisheries may be under consideration in the ocean area from Cape Falcon, Oregon to the U.S./Canada border. Observed mark rates in previous mark-selective fisheries north of Cape Falcon ranged from 53 to 71 percent. Similar mark rates are expected in this area for 2023.

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

| Year | SRFC Ocean Harvest South of Cape Falcon ^{a/} | | | | River Harvest | Spawning Escapement | | | Sacramento Index (SI) ^{c/} | Exploitation Rate (%) ^{d/} |
|------|--|-------|-----------------------|---------|--------------------|---------------------|----------|-------|--|--|
| | Troll | Sport | Non-Ret ^{b/} | Total | | Natural | Hatchery | Total | | |
| 1983 | 246.6 | 86.3 | 0.0 | 332.9 | 18.0 | 91.7 | 18.6 | 110.2 | 461.1 | 76 |
| 1984 | 266.2 | 87.0 | 0.0 | 353.1 | 25.9 | 120.2 | 38.7 | 159.0 | 538.1 | 70 |
| 1985 | 355.5 | 158.9 | 0.0 | 514.4 | 39.1 | 210.1 | 29.3 | 239.3 | 792.8 | 70 |
| 1986 | 619.0 | 137.5 | 0.0 | 756.4 | 39.2 | 218.3 | 21.8 | 240.1 | 1,035.7 | 77 |
| 1987 | 686.1 | 173.1 | 0.0 | 859.2 | 31.8 | 175.2 | 19.8 | 195.1 | 1,086.1 | 82 |
| 1988 | 1,163.2 | 188.3 | 0.0 | 1,351.5 | 37.1 | 200.7 | 26.8 | 227.5 | 1,616.1 | 86 |
| 1989 | 602.8 | 157.1 | 0.0 | 759.9 | 24.9 | 127.6 | 24.9 | 152.6 | 937.3 | 84 |
| 1990 | 507.3 | 150.4 | 0.0 | 657.8 | 17.2 | 83.3 | 21.7 | 105.1 | 780.0 | 87 |
| 1991 | 300.1 | 89.6 | 0.0 | 389.7 | 26.0 ^{e/} | 92.8 | 26.0 | 118.9 | 534.6 | 78 |
| 1992 | 233.3 | 69.4 | 0.0 | 302.8 | 13.3 ^{e/} | 59.9 | 21.7 | 81.5 | 397.6 | 79 |
| 1993 | 342.8 | 115.3 | 0.0 | 458.1 | 27.7 ^{e/} | 112.8 | 24.6 | 137.4 | 623.2 | 78 |
| 1994 | 303.5 | 168.8 | 0.0 | 472.3 | 28.9 ^{e/} | 135.0 | 30.6 | 165.6 | 666.7 | 75 |
| 1995 | 730.7 | 390.4 | 0.0 | 1,121.0 | 48.2 | 253.8 | 41.5 | 295.3 | 1,464.6 | 80 |
| 1996 | 426.8 | 157.0 | 0.0 | 583.8 | 49.2 | 269.1 | 32.5 | 301.6 | 934.7 | 68 |
| 1997 | 579.7 | 210.3 | 0.0 | 790.0 | 56.3 | 281.6 | 63.3 | 344.8 | 1,191.1 | 71 |
| 1998 | 292.3 | 114.0 | 0.0 | 406.3 | 69.8 ^{e/} | 176.0 | 69.9 | 245.9 | 722.1 | 66 |
| 1999 | 289.1 | 76.2 | 0.0 | 365.3 | 68.9 ^{e/} | 357.6 | 42.2 | 399.8 | 834.0 | 52 |
| 2000 | 421.8 | 152.8 | 0.0 | 574.6 | 59.5 ^{e/} | 370.0 | 47.6 | 417.5 | 1,051.6 | 60 |
| 2001 | 284.4 | 93.4 | 0.0 | 377.9 | 97.4 | 539.4 | 57.4 | 596.8 | 1,072.0 | 44 |
| 2002 | 447.7 | 184.0 | 0.0 | 631.7 | 89.2 ^{e/} | 684.2 | 85.6 | 769.9 | 1,490.8 | 48 |
| 2003 | 501.6 | 106.4 | 0.0 | 608.0 | 85.4 | 414.6 | 108.4 | 523.0 | 1,216.3 | 57 |
| 2004 | 621.8 | 212.6 | 0.0 | 834.5 | 46.8 | 206.2 | 80.7 | 286.9 | 1,168.2 | 75 |
| 2005 | 367.9 | 127.0 | 0.0 | 494.9 | 64.6 | 214.9 | 181.1 | 396.0 | 955.5 | 59 |
| 2006 | 149.9 | 107.7 | 0.0 | 257.7 | 44.9 | 196.5 | 78.5 | 275.0 | 577.6 | 52 |
| 2007 | 119.9 | 32.0 | 0.0 | 152.0 | 14.3 ^{e/} | 70.1 | 21.3 | 91.4 | 257.7 | 65 |
| 2008 | 3.2 | 0.9 | 0.0 | 4.1 | 0.1 ^{e/} | 47.3 | 18.0 | 65.4 | 69.6 | 6 |
| 2009 | 0.0 | 0.2 | 0.1 | 0.3 | 0.0 ^{e/} | 24.9 | 15.9 | 40.9 | 41.1 | 1 |
| 2010 | 11.2 | 11.4 | 0.3 | 22.8 | 2.7 ^{e/} | 91.1 | 33.2 | 124.3 | 149.8 | 17 |

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

| Year | SRFC Ocean Harvest South of Cape Falcon ^{a/} | | | | River Harvest | Spawning Escapement | | | Sacramento Index (SI) ^{c/} | Exploitation Rate (%) ^{d/} |
|--------------------|--|-------|-----------------------|-------|--------------------|---------------------|----------|-------|--|--|
| | Troll | Sport | Non-Ret ^{b/} | Total | | Natural | Hatchery | Total | | |
| 2011 | 46.7 | 22.8 | 0.0 | 69.5 | 18.2 ^{e/} | 77.9 | 41.5 | 119.3 | 207.0 | 42 |
| 2012 | 183.1 | 93.4 | 0.3 | 276.7 | 65.8 ^{e/} | 166.2 | 119.2 | 285.4 | 627.9 | 55 |
| 2013 | 290.7 | 114.3 | 0.0 | 404.9 | 57.5 ^{e/} | 305.6 | 101.2 | 406.8 | 869.3 | 53 |
| 2014 | 240.6 | 62.4 | 0.0 | 303.0 | 35.7 ^{e/} | 168.7 | 43.8 | 212.5 | 551.2 | 61 |
| 2015 | 100.1 | 24.5 | 0.0 | 124.6 | 16.9 ^{e/} | 74.5 | 39.0 | 113.5 | 254.9 | 55 |
| 2016 | 62.9 | 28.9 | 0.0 | 91.8 | 23.9 ^{e/} | 56.3 | 33.4 | 89.7 | 205.3 | 56 |
| 2017 | 38.7 | 31.9 | 0.0 | 70.7 | 22.1 ^{e/} | 17.9 | 26.5 | 44.3 | 137.1 | 68 |
| 2018 | 53.7 | 45.0 | 0.0 | 98.6 | 16.3 ^{e/} | 71.7 | 33.8 | 105.5 | 220.4 | 52 |
| 2019 | 248.6 | 74.4 | 0.0 | 323.0 | 20.3 ^{e/} | 121.6 | 42.1 | 163.8 | 507.1 | 68 |
| 2020 | 154.9 | 44.6 | 0.0 | 199.5 | 14.9 ^{e/} | 100.2 | 37.9 | 138.1 | 352.5 | 61 |
| 2021 | 165.8 | 41.7 | 0.0 | 207.4 | 10.8 ^{e/} | 72.8 | 32.8 | 104.5 | 322.7 | 68 |
| 2022 ^{f/} | 134.9 | 49.5 | 0.0 | 184.5 | 4.9 ^{e/} | 32.7 | 29.1 | 61.9 | 251.2 | 75 |

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.

| Year | Escapement ^{a/} | 3-yr. | Abundance Forecast ^{c/} | Age-3 impact rate south of Point Arena, CA | | |
|------|--------------------------|--|-------------------------------------|--|---------------------------|----------------------------|
| | | Geometric Mean Escapement ^{b/} | | Maximum Allow able (%) ^{d/} | Preseason Forecast (%) | Postseason Estimate (%) |
| 2000 | -- | -- | - | - | - | 21.4 |
| 2001 | 8,224 | -- | - | - | - | 23.3 |
| 2002 | 7,464 | -- | - | - | - | 21.8 |
| 2003 | 8,218 | -- | - | - | - | 10.3 |
| 2004 | 7,869 | 7,960 | - | - | - | 24.8 |
| 2005 | 15,839 | 7,844 | - | - | - | 17.2 |
| 2006 | 17,290 | 10,080 | - | - | - | 15.1 |
| 2007 | 2,541 | 12,917 | - | - | - | 17.8 |
| 2008 | 2,830 | 8,862 | - | - | - | 0.0 |
| 2009 | 4,537 | 4,991 | - | - | - | 0.0 |
| 2010 | 1,596 | 3,195 | - | - | - | e/ |
| 2011 | 824 | 2,737 | - | - | - | 28.3 |
| 2012 | 2,671 | 1,814 | - | 13.7 | 13.7 | 12.6 |
| 2013 | 6,084 | 1,520 | - | 12.9 | 12.9 | 18.8 |
| 2014 | 3,015 | 2,375 | - | 15.4 | 15.4 | 15.8 |
| 2015 | 3,439 | 3,659 | - | 19.0 | 17.5 | e/ |
| 2016 | 1,546 | 3,981 | - | 19.9 | 12.8 | 10.7 |
| 2017 | 975 | 2,521 | - | 15.8 | 12.2 | 17.6 |
| 2018 | 2,638 | 1,731 | 1,594 | 14.4 | 8.5 | 13.9 |
| 2019 | 8,129 | 1,584 | 1,924 | 15.7 | 14.8 | 10.0 |
| 2020 | 10,516 | 2,755 | 3,077 | 20.0 | 16.2 | 13.1 |
| 2021 | 6,038 | 5,421 | 9,063 | 20.0 | 14.7 | 19.3 ^{f/} |
| 2022 | NA | 8,596 | 5,971 | 20.0 | 15.2 | NA ^{g/} |
| 2023 | NA | 7,784 | 4,540 | 20.0 | NA | NA |

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

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

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

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

e/ Insufficient data for postseason estimate.

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

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

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

| Year (t) | Ocean Abundance Sept. 1 (t-1) | | | Annual Ocean Harvest Rate Sept. 1 (t-1) - Aug. 31 (t) | | Klamath Basin River Run (t) | | | | |
|----------|-------------------------------|-------|---------|---|-------|-----------------------------|-------|-------|-------|--------------|
| | Age-3 | Age-4 | Total | Age-3 | Age-4 | Age-2 | Age-3 | Age-4 | Age-5 | Total Adults |
| | | | | | | | | | | |
| 1981 | 493.2 | 57.0 | 550.2 | 0.21 | 0.53 | 28.2 | 64.1 | 14.4 | 1.8 | 80.3 |
| 1982 | 561.1 | 133.4 | 694.5 | 0.30 | 0.52 | 39.4 | 30.1 | 33.9 | 2.6 | 66.6 |
| 1983 | 313.3 | 114.2 | 427.5 | 0.19 | 0.60 | 3.8 | 35.9 | 20.7 | 0.9 | 57.5 |
| 1984 | 157.3 | 82.8 | 240.1 | 0.08 | 0.38 | 8.3 | 21.7 | 24.4 | 1.1 | 47.2 |
| 1985 | 374.8 | 56.9 | 431.7 | 0.11 | 0.24 | 69.4 | 32.9 | 25.7 | 5.8 | 64.4 |
| 1986 | 1,304.4 | 140.8 | 1,445.2 | 0.18 | 0.46 | 44.6 | 162.9 | 29.8 | 2.3 | 195.0 |
| 1987 | 781.1 | 341.9 | 1,123.0 | 0.16 | 0.43 | 19.1 | 89.7 | 112.6 | 6.8 | 209.1 |
| 1988 | 756.3 | 234.8 | 991.0 | 0.20 | 0.39 | 24.1 | 101.2 | 86.5 | 3.9 | 191.6 |
| 1989 | 369.8 | 177.2 | 547.1 | 0.15 | 0.36 | 9.1 | 50.4 | 69.6 | 4.3 | 124.3 |
| 1990 | 176.1 | 104.0 | 280.1 | 0.30 | 0.55 | 4.4 | 11.6 | 22.9 | 1.3 | 35.9 |
| 1991 | 69.4 | 37.2 | 106.6 | 0.03 | 0.18 | 1.8 | 10.0 | 21.6 | 1.1 | 32.7 |
| 1992 | 39.5 | 28.2 | 67.7 | 0.02 | 0.07 | 13.7 | 6.9 | 18.8 | 1.0 | 26.7 |
| 1993 | 168.5 | 15.0 | 183.5 | 0.05 | 0.16 | 7.6 | 48.3 | 8.2 | 0.7 | 57.2 |
| 1994 | 119.9 | 41.7 | 161.7 | 0.03 | 0.09 | 14.4 | 37.0 | 26.0 | 1.0 | 64.0 |
| 1995 | 787.3 | 28.7 | 816.0 | 0.04 | 0.14 | 22.8 | 201.9 | 18.3 | 2.6 | 222.8 |
| 1996 | 192.3 | 226.3 | 418.6 | 0.05 | 0.16 | 9.5 | 38.8 | 136.7 | 0.3 | 175.8 |
| 1997 | 140.2 | 62.8 | 203.0 | 0.01 | 0.06 | 8.0 | 35.0 | 44.2 | 4.6 | 83.7 |
| 1998 | 154.8 | 44.7 | 199.5 | 0.00 | 0.09 | 4.6 | 59.2 | 29.7 | 1.7 | 90.6 |
| 1999 | 129.1 | 30.5 | 159.5 | 0.02 | 0.09 | 19.2 | 29.2 | 20.5 | 1.3 | 51.0 |
| 2000 | 617.1 | 44.2 | 661.3 | 0.06 | 0.10 | 10.2 | 187.1 | 30.5 | 0.5 | 218.1 |
| 2001 | 356.1 | 133.8 | 489.9 | 0.03 | 0.09 | 11.3 | 99.1 | 88.2 | 0.1 | 187.3 |
| 2002 | 513.6 | 98.9 | 612.5 | 0.02 | 0.15 | 9.2 | 94.6 | 62.5 | 3.7 | 160.8 |
| 2003 | 401.1 | 192.2 | 593.3 | 0.08 | 0.21 | 3.8 | 94.3 | 96.8 | 0.9 | 191.9 |
| 2004 | 159.4 | 105.2 | 264.7 | 0.12 | 0.35 | 9.6 | 33.1 | 40.5 | 5.3 | 78.9 |
| 2005 | 190.0 | 38.1 | 228.1 | 0.02 | 0.20 | 2.3 | 43.8 | 17.5 | 3.9 | 65.2 |
| 2006 | 90.7 | 63.4 | 154.1 | 0.01 | 0.10 | 26.9 | 18.5 | 41.6 | 1.3 | 61.4 |
| 2007 | 376.9 | 33.7 | 410.6 | 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 | 240.8 | 21.1 | 261.9 | 0.00 | 0.00 | 11.9 | 78.6 | 16.4 | 5.6 | 100.6 |
| 2010 | 192.8 | 62.1 | 254.8 | 0.01 | 0.04 | 16.6 | 46.1 | 44.3 | 0.4 | 90.9 |

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

| Year (t) | Ocean Abundance Sept. 1 (t-1) | | | Annual Ocean Harvest Rate Sept. 1 (t-1) - Aug. 31 (t) | | Klamath Basin River Run (t) | | | | |
|----------|-------------------------------|--------------------|-------|---|-------|-----------------------------|-------|-------|-------|--------------|
| | Age-3 | Age-4 | Total | Age-3 | Age-4 | Age-2 | Age-3 | Age-4 | Age-5 | Total Adults |
| 2011 | 240.2 | 64.6 | 304.8 | 0.03 | 0.08 | 84.9 | 59.0 | 41.0 | 2.0 | 102.0 |
| 2012 | 799.4 | 74.3 | 873.7 | 0.03 | 0.08 | 21.4 | 243.9 | 49.3 | 2.1 | 295.3 |
| 2013 | 438.4 | 194.4 | 632.9 | 0.04 | 0.20 | 14.4 | 55.2 | 108.8 | 1.1 | 165.0 |
| 2014 | 216.5 | 180.7 | 397.2 | 0.03 | 0.17 | 22.3 | 57.8 | 98.7 | 3.9 | 160.4 |
| 2015 | 110.5 | 61.0 | 171.5 | 0.02 | 0.22 | 6.1 | 36.7 | 34.0 | 7.1 | 77.8 |
| 2016 | 32.7 | 24.8 | 57.4 | 0.01 | 0.09 | 2.8 | 8.6 | 15.5 | 0.5 | 24.6 |
| 2017 | 63.2 | 9.8 | 73.1 | 0.02 | 0.04 | 20.3 | 24.4 | 7.3 | 1.6 | 33.2 |
| 2018 | 193.7 | 10.5 | 204.2 | 0.06 | 0.24 | 10.9 | 85.5 | 5.6 | 0.0 | 91.1 |
| 2019 | 81.8 | 15.7 | 97.5 | 0.04 | 0.36 | 10.0 | 30.2 | 6.8 | 0.1 | 37.1 |
| 2020 | 128.4 | 14.2 | 142.7 | 0.01 ^{a/} | 0.23 | 9.1 | 37.8 | 7.6 | 0.0 | 45.4 |
| 2021 | 142.7 ^{a/} | 35.4 | 178.1 | 0.05 ^{a/} | 0.28 | 10.4 | 36.3 | 17.7 | 0.2 | 54.2 |
| 2022 | 162.5 ^{b/} | 38.4 ^{a/} | 200.9 | ---- ^{c/} | 0.38 | 7.6 | 32.2 | 14.3 | 0.2 | 46.7 |

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)

| Preseason Forecast ^{a/} | | Postseason Estimate | |
|----------------------------------|-----------------------|---------------------|----------------|
| Year (t) | Sept. 1 (t-1) | Sept. 1 (t-1) | Pre/Postseason |
| Age-3 | | | |
| 1985 | 113,000 | 374,822 | 0.30 |
| 1986 | 426,000 ^{b/} | 1,304,409 | 0.33 |
| 1987 | 511,800 | 781,122 | 0.66 |
| 1988 | 370,800 | 756,261 | 0.49 |
| 1989 | 450,600 | 369,828 | 1.22 |
| 1990 | 479,000 | 176,122 | 2.72 |
| 1991 | 176,200 | 69,424 | 2.54 |
| 1992 | 50,000 | 39,502 | 1.27 |
| 1993 | 294,400 | 168,473 | 1.75 |
| 1994 | 138,000 | 119,915 | 1.15 |
| 1995 | 269,000 | 787,309 | 0.34 |
| 1996 | 479,800 | 192,272 | 2.50 |
| 1997 | 224,600 | 140,153 | 1.60 |
| 1998 | 176,000 | 154,799 | 1.14 |
| 1999 | 84,800 | 129,066 | 0.66 |
| 2000 | 349,600 | 617,097 | 0.57 |
| 2001 | 187,200 | 356,128 | 0.53 |
| 2002 | 209,000 | 513,604 | 0.41 |
| 2003 | 171,300 | 401,112 | 0.43 |
| 2004 | 72,100 | 159,446 | 0.45 |
| 2005 | 185,700 | 189,977 | 0.98 |
| 2006 | 44,100 | 90,666 | 0.49 |
| 2007 | 515,400 | 376,940 | 1.37 |
| 2008 | 31,600 | 68,015 | 0.46 |
| 2009 | 474,900 | 240,787 | 1.97 |
| 2010 | 223,400 | 192,750 | 1.16 |
| 2011 | 304,600 | 240,222 | 1.27 |
| 2012 | 1,567,600 | 799,446 | 1.96 |
| 2013 | 390,700 | 438,443 | 0.89 |
| 2014 | 219,800 | 216,493 | 1.02 |
| 2015 | 342,200 | 110,506 | 3.10 |
| 2016 | 93,400 | 32,670 | 2.86 |
| 2017 | 42,000 | 63,235 | 0.66 |
| 2018 | 330,000 | 193,685 | 1.70 |
| 2019 | 167,500 | 81,818 | 2.05 |
| 2020 | 149,600 | 128,444 | 1.16 |
| 2021 | 135,600 | 142,717 | 0.95 |
| 2022 ^{c/} | 155,000 | 162,466 | 0.95 |
| 2023 | 75,300 | -- | -- |

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

| | Preseason Forecast ^{a/} | Postseason Estimate | |
|--------------------|----------------------------------|---------------------|----------------|
| Year (t) | Sept. 1 (t-1) | Sept. 1 (t-1) | Pre/Postseason |
| | Age-4 | | |
| 1985 | 56,900 | 56,908 | 1.00 |
| 1986 | 66,300 | 140,823 | 0.47 |
| 1987 | 206,100 | 341,875 | 0.60 |
| 1988 | 186,400 | 234,751 | 0.79 |
| 1989 | 215,500 | 177,245 | 1.22 |
| 1990 | 50,100 | 103,951 | 0.48 |
| 1991 | 44,600 | 37,171 | 1.20 |
| 1992 | 44,800 | 28,169 | 1.59 |
| 1993 | 39,100 | 15,037 | 2.60 |
| 1994 | 86,100 | 41,736 | 2.06 |
| 1995 | 47,000 | 28,726 | 1.64 |
| 1996 | 268,500 | 226,282 | 1.19 |
| 1997 | 53,900 | 62,820 | 0.86 |
| 1998 | 46,000 | 44,733 | 1.03 |
| 1999 | 78,800 | 30,456 | 2.59 |
| 2000 | 38,900 | 44,176 | 0.88 |
| 2001 | 247,000 | 133,801 | 1.85 |
| 2002 | 143,800 | 98,927 | 1.45 |
| 2003 | 132,400 | 192,180 | 0.69 |
| 2004 | 134,500 | 105,246 | 1.28 |
| 2005 | 48,900 | 38,079 | 1.28 |
| 2006 | 63,700 | 63,384 | 1.00 |
| 2007 | 26,100 | 33,650 | 0.78 |
| 2008 | 157,200 | 81,411 | 1.93 |
| 2009 | 25,200 | 21,131 | 1.19 |
| 2010 | 106,300 | 62,089 | 1.71 |
| 2011 | 61,600 | 64,570 | 0.95 |
| 2012 | 79,600 | 74,300 | 1.07 |
| 2013 | 331,200 | 194,407 | 1.70 |
| 2014 | 67,400 | 180,669 | 0.37 |
| 2015 | 71,100 | 60,979 | 1.17 |
| 2016 | 45,100 | 24,777 | 1.82 |
| 2017 | 10,600 | 9,821 | 1.08 |
| 2018 | 28,400 | 10,531 | 2.70 |
| 2019 | 106,100 | 15,660 | 6.78 |
| 2020 | 36,200 | 14,237 | 2.54 |
| 2021 | 45,100 | 35,419 | 1.27 |
| 2022 ^{c/} | 43,200 | 38,427 | 1.12 |
| 2023 | 27,200 | | |

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

| Preseason Forecast ^{a/} | | Postseason Estimate | |
|----------------------------------|---------------|---------------------|----------------|
| Year (t) | Sept. 1 (t-1) | Sept. 1 (t-1) | Pre/Postseason |
| Age-5 | | | |
| 1985 | NA | 11,113 | NA |
| 1986 | NA | 6,376 | NA |
| 1987 | 5,300 | 19,414 | 0.27 |
| 1988 | 13,300 | 14,632 | 0.91 |
| 1989 | 10,100 | 9,612 | 1.05 |
| 1990 | 7,600 | 7,767 | 0.98 |
| 1991 | 1,500 | 2,774 | 0.54 |
| 1992 | 1,300 | 1,444 | 0.90 |
| 1993 | 1,100 | 1,759 | 0.63 |
| 1994 | 500 | 1,468 | 0.34 |
| 1995 | 2,000 | 3,805 | 0.53 |
| 1996 | 1,100 | 788 | 1.40 |
| 1997 | 7,900 | 9,004 | 0.88 |
| 1998 | 3,300 | 2,382 | 1.39 |
| 1999 | 2,000 | 2,106 | 0.95 |
| 2000 | 1,400 | 1,051 | 1.33 |
| 2001 | 1,300 | 258 | 5.04 |
| 2002 | 9,700 | 6,933 | 1.40 |
| 2003 | 6,500 | 1,915 | 3.39 |
| 2004 | 9,700 | 17,184 | 0.56 |
| 2005 | 5,200 | 6,859 | 0.76 |
| 2006 | 2,200 | 5,236 | 0.42 |
| 2007 | 4,700 | 2,911 | 1.61 |
| 2008 | 1,900 | 2,900 | 0.66 |
| 2009 | 5,600 | 7,059 | 0.79 |
| 2010 | 1,800 | 517 | 3.48 |
| 2011 | 5,000 | 2,753 | 1.82 |
| 2012 | 4,600 | 5,110 | 0.90 |
| 2013 | 5,700 | 3,945 | 1.44 |
| 2014 | 12,100 | 7,625 | 1.59 |
| 2015 | 10,400 | 13,283 | 0.78 |
| 2016 | 3,700 | 1,142 | 3.24 |
| 2017 | 1,700 | 2,024 | 0.84 |
| 2018 | 800 | 50 | 16.00 |
| 2019 | 600 | 220 | 2.73 |
| 2020 | 700 | 24 | 29.17 |
| 2021 | 800 | -- | -- |
| 2022 ^{c/} | 1,900 | 533 | 3.56 |
| 2023 | 1,300 | -- | -- |

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

| Preseason Forecast ^{a/} | | Postseason Estimate | |
|----------------------------------|-----------------------|---------------------|----------------|
| Year (t) | Sept. 1 (t-1) | Sept. 1 (t-1) | Pre/Postseason |
| Total Adults | | | |
| 1985 | 169,900 ^{d/} | 442,843 | 0.38 |
| 1986 | 492,300 ^{d/} | 1,451,608 | 0.34 |
| 1987 | 723,200 | 1,142,411 | 0.63 |
| 1988 | 570,500 | 1,005,644 | 0.57 |
| 1989 | 676,200 | 556,685 | 1.21 |
| 1990 | 536,700 | 287,840 | 1.86 |
| 1991 | 222,300 | 109,369 | 2.03 |
| 1992 | 96,100 | 69,115 | 1.39 |
| 1993 | 334,600 | 185,269 | 1.81 |
| 1994 | 224,600 | 163,119 | 1.38 |
| 1995 | 318,000 | 819,840 | 0.39 |
| 1996 | 749,400 | 419,342 | 1.79 |
| 1997 | 286,400 | 211,977 | 1.35 |
| 1998 | 225,300 | 201,914 | 1.12 |
| 1999 | 165,600 | 161,628 | 1.02 |
| 2000 | 389,900 | 662,324 | 0.59 |
| 2001 | 435,500 | 490,187 | 0.89 |
| 2002 | 362,500 | 619,464 | 0.59 |
| 2003 | 310,200 | 595,207 | 0.52 |
| 2004 | 216,300 | 281,876 | 0.77 |
| 2005 | 239,800 | 234,915 | 1.02 |
| 2006 | 110,000 | 159,286 | 0.69 |
| 2007 | 546,200 | 413,501 | 1.32 |
| 2008 | 190,700 | 152,326 | 1.25 |
| 2009 | 505,700 | 268,977 | 1.88 |
| 2010 | 331,500 | 255,356 | 1.30 |
| 2011 | 371,100 | 307,545 | 1.21 |
| 2012 | 1,651,800 | 878,856 | 1.88 |
| 2013 | 727,700 | 636,795 | 1.14 |
| 2014 | 299,300 | 404,787 | 0.74 |
| 2015 | 423,800 | 184,768 | 2.29 |
| 2016 | 142,200 | 58,589 | 2.43 |
| 2017 | 54,200 | 75,080 | 0.72 |
| 2018 | 359,200 | 204,266 | 1.76 |
| 2019 | 274,200 | 97,698 | 2.81 |
| 2020 | 186,600 | 142,705 | 1.31 |
| 2021 | 181,500 | 178,136 | 1.02 |
| 2022 ^{c/} | 200,100 | 201,426 | 0.99 |
| 2023 | 103,800 | -- | -- |

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

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

c/ Postseason estimates are preliminary.

d/ Does not include age-5 adults.

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

| Average or Year (t) | Preseason | | Postseason | | Preseason | | Postseason | | Preseason | | Postseason | |
|---------------------------|------------------------|---------|-----------------|---------|------------------------|-------|------------------------|-------|-----------|---------|------------|---------|
| | Ocean Abundance | | Ocean Abundance | | Age-4 | | Age-4 | | Adult | | Adult | |
| | Sept. 1 (t-1) | | Sept. 1 (t-1) | | Harvest Rate | | Harvest Rate | | Harvest | | Harvest | |
| | Forecast ^{a/} | | Estimate | | Forecast ^{b/} | | Estimate ^{c/} | | Forecast | | Estimate | |
| | Age-3 | Age-4 | Age-3 | Age-4 | Ocean | River | Ocean | River | Ocean | River | Ocean | River |
| 1986-90 | 447,640 | 144,880 | 677,548 | 199,729 | 0.30 | 0.51 | 0.44 | 0.54 | 104,100 | 56,020 | 214,598 | 51,814 |
| 1991-95 | 185,520 | 52,320 | 236,925 | 30,168 | 0.09 | 0.28 | 0.13 | 0.34 | 12,980 | 14,460 | 13,095 | 13,667 |
| 1996-00 | 262,960 | 97,220 | 246,677 | 81,693 | 0.11 | 0.44 | 0.10 | 0.33 | 30,500 | 44,180 | 21,336 | 31,382 |
| 2001 | 187,200 | 247,000 | 356,128 | 133,801 | 0.14 | 0.61 | 0.09 | 0.29 | 45,600 | 105,300 | 21,747 | 50,780 |
| 2002 | 209,000 | 143,800 | 513,604 | 98,927 | 0.13 | 0.57 | 0.15 | 0.26 | 30,000 | 70,900 | 28,896 | 35,069 |
| 2003 | 171,300 | 132,400 | 401,112 | 192,180 | 0.16 | 0.50 | 0.21 | 0.28 | 30,600 | 52,200 | 70,995 | 39,715 |
| 2004 | 72,100 | 134,500 | 159,446 | 105,246 | 0.15 | 0.38 | 0.35 | 0.48 | 26,500 | 35,800 | 64,226 | 29,807 |
| 2005 | 185,700 | 48,900 | 189,977 | 38,079 | 0.08 | 0.16 | 0.20 | 0.19 | 7,100 | 9,600 | 12,807 | 10,001 |
| 2006 | 44,100 | 63,700 | 90,666 | 63,384 | 0.11 | 0.23 | 0.10 | 0.18 | 10,000 | 10,000 | 10,401 | 10,345 |
| 2007 | 515,400 | 26,100 | 376,940 | 33,650 | 0.16 | 0.63 | 0.21 | 0.56 | 30,200 | 51,400 | 30,275 | 33,884 |
| 2008 | 31,600 | 157,200 | 68,015 | 81,411 | 0.02 | 0.43 | 0.10 | 0.38 | 4,500 | 49,500 | 8,716 | 24,180 |
| 2009 | 474,900 | 25,200 | 240,787 | 21,131 | 0.00 | 0.57 | 0.00 | 0.40 | 100 | 61,700 | 53 | 34,040 |
| 2010 | 223,400 | 106,300 | 192,750 | 62,089 | 0.12 | 0.49 | 0.04 | 0.40 | 22,600 | 46,600 | 4,489 | 32,920 |
| 2011 | 304,600 | 61,600 | 240,222 | 64,570 | 0.16 | 0.54 | 0.08 | 0.34 | 26,900 | 42,700 | 12,011 | 30,502 |
| 2012 | 1,567,600 | 79,600 | 799,446 | 74,300 | 0.16 | 0.77 | 0.08 | 0.51 | 92,400 | 227,600 | 34,719 | 109,263 |
| 2013 | 390,700 | 331,200 | 438,443 | 194,407 | 0.16 | 0.62 | 0.20 | 0.51 | 74,800 | 154,800 | 59,511 | 82,835 |
| 2014 | 219,800 | 67,400 | 216,493 | 180,669 | 0.16 | 0.40 | 0.17 | 0.25 | 23,200 | 31,400 | 40,158 | 31,353 |
| 2015 | 342,200 | 71,100 | 110,506 | 60,979 | 0.16 | 0.59 | 0.22 | 0.47 | 29,400 | 57,700 | 20,019 | 35,890 |
| 2016 | 93,400 | 45,100 | 32,670 | 24,777 | 0.08 | 0.19 | 0.09 | 0.31 | 6,300 | 8,500 | 3,025 | 6,470 |
| 2017 | 42,000 | 10,600 | 63,236 | 9,821 | 0.03 | 0.06 | 0.04 | 0.08 | 700 | 900 | 1,783 | 1,951 |
| 2018 | 330,000 | 28,400 | 193,685 | 10,531 | 0.12 | 0.34 | 0.24 | 0.36 | 14,600 | 21,600 | 13,227 | 18,879 |
| 2019 | 167,500 | 106,100 | 81,818 | 15,660 | 0.16 | 0.47 | 0.36 | 0.38 | 24,800 | 40,000 | 8,677 | 11,365 |
| 2020 | 149,600 | 36,200 | 128,444 | 14,237 | 0.09 | 0.22 | 0.23 | 0.37 | 7,300 | 9,900 | 4,679 | 10,335 |
| 2021 | 135,600 | 45,100 | 142,717 | 35,419 | 0.11 | 0.19 | 0.28 | 0.22 | 6,900 | 9,400 | 17,453 | 10,487 |
| 2022 ^{d/} | 155,000 | 43,200 | 162,466 | 38,427 | 0.11 | 0.22 | 0.38 | 0.31 | 7,300 | 11,600 | 24,973 | 10,496 |
| 2023 ^{e/} | 75,300 | 27,200 | - | - | - | - | - | - | - | - | - | - |

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

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

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

d/ Postseason estimates are preliminary for age-3.

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

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

| TABLE 10. Harvest levels and rates of age-3 and age-4 Kumaha River fall Chinook. (Page 1 of 7) | | | | | | | | | | |
|--|--|--------|----------|----------|----------|----------|-------------|---------------------|--------|--------|
| Year (t) or Average | Ocean Fisheries (Sept. 1 (t-1) - Aug. 31 (t)) | | | | | | | River Fisheries (t) | | |
| | KMZ | | | North of | South of | Subtotal | Ocean Total | Net | Sport | Total |
| | Troll | Sport | Subtotal | KMZ | KMZ | | | | | |
| HARVEST (numbers of fish) | | | | | | | | | | |
| Age-3 | | | | | | | | | | |
| 1986-90 | 15,081 | 6,253 | 21,334 | 38,683 | 64,397 | 103,080 | 124,414 | 7,200 | 9,480 | 16,680 |
| 1991-95 | 8 | 689 | 698 | 3,055 | 5,086 | 8,141 | 8,839 | 4,980 | 2,189 | 7,170 |
| 1996-00 | 93 | 740 | 833 | 2,157 | 7,326 | 9,483 | 10,316 | 8,840 | 3,764 | 12,604 |
| 2001 | 113 | 105 | 218 | 2,749 | 6,082 | 8,831 | 9,049 | 17,885 | 7,294 | 25,179 |
| 2002 | 220 | 784 | 1,004 | 1,501 | 9,916 | 11,417 | 12,421 | 11,734 | 6,258 | 17,992 |
| 2003 | 176 | 669 | 845 | 1,921 | 27,586 | 29,507 | 30,352 | 6,996 | 5,061 | 12,057 |
| 2004 | 402 | 970 | 1,372 | 9,710 | 7,324 | 17,034 | 18,406 | 4,679 | 2,051 | 6,730 |
| 2005 | 0 | 568 | 568 | 619 | 2,381 | 3,000 | 3,568 | 4,394 | 1,641 | 6,035 |
| 2006 | 0 | 478 | 478 | 32 | 341 | 373 | 851 | 2,388 | 13 | 2,401 |
| 2007 | 770 | 8,101 | 8,871 | 4,194 | 9,366 | 13,560 | 22,431 | 17,543 | 5,734 | 23,277 |
| 2008 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3,225 | 608 | 3,833 |
| 2009 | 0 | 53 | 53 | 0 | 0 | 0 | 53 | 19,820 | 4,715 | 24,535 |
| 2010 | 106 | 28 | 134 | 0 | 1,664 | 1,664 | 1,798 | 13,132 | 1,884 | 15,016 |
| 2011 | 334 | 1,119 | 1,453 | 48 | 4,829 | 4,877 | 6,330 | 13,286 | 2,630 | 15,916 |
| 2012 | 1,116 | 11,350 | 12,466 | 928 | 13,089 | 14,017 | 26,483 | 70,409 | 12,104 | 82,513 |
| 2013 | 390 | 5,574 | 5,964 | 868 | 12,053 | 12,921 | 18,885 | 18,996 | 7,675 | 26,671 |
| 2014 | 0 | 566 | 566 | 4,144 | 1,550 | 5,694 | 6,260 | 3,386 | 1,778 | 5,164 |
| 2015 | 48 | 293 | 341 | 652 | 1,597 | 2,249 | 2,590 | 10,604 | 4,509 | 15,113 |
| 2016 | 0 | 0 | 0 | 14 | 308 | 322 | 322 | 918 | 430 | 1,348 |
| 2017 | 0 | 0 | 0 | 115 | 1,263 | 1,378 | 1,378 | 1,261 | 23 | 1,284 |
| 2018 | 1,511 | 1,628 | 3,139 | 3,960 | 3,577 | 7,537 | 10,676 | 12,954 | 3,931 | 16,885 |
| 2019 | 157 | 371 | 528 | 181 | 2,391 | 2,572 | 3,100 | 4,089 | 4,656 | 8,745 |
| 2020 | 0 | 43 | 43 | 45 | 1,233 | 1,278 | 1,321 | 2,997 | 4,554 | 7,551 |
| 2021 ^{a/} | 0 | 279 | 279 | 777 | 6,634 | 7,411 | 7,690 | 4,648 | 1,803 | 6,451 |
| 2022 ^{a/} | 0 | 538 | 538 | 15 | 9,408 | 9,423 | 9,961 | 3,947 | 1,976 | 5,923 |

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

| TABLE 10. Harvest levels and rates of age-5 and age-7 Atlantic River Herring (Page 2 of 7) | | | | | | | | | | |
|--|--|-------|----------|----------|----------|----------|-------------|---------------------|--------|--------|
| Year (t) or Average | Ocean Fisheries (Sept. 1 (t-1) - Aug. 31 (t)) | | | | | | | River Fisheries (t) | | |
| | KMZ | | | North of | South of | Subtotal | Ocean Total | Net | Sport | Total |
| | Troll | Sport | Subtotal | KMZ | KMZ | | | | | |
| HARVEST (numbers of fish) | | | | | | | | | | |
| Age-4 | | | | | | | | | | |
| 1986-90 | 10,282 | 4,358 | 14,640 | 38,450 | 31,653 | 70,103 | 84,743 | 28,720 | 5,500 | 34,220 |
| 1991-95 | 34 | 484 | 519 | 1,438 | 1,807 | 3,245 | 3,764 | 5,072 | 856 | 5,928 |
| 1996-00 | 200 | 1,002 | 1,202 | 3,833 | 5,093 | 8,926 | 10,128 | 15,076 | 2,948 | 18,023 |
| 2001 | 1,312 | 1,604 | 2,916 | 5,819 | 3,926 | 9,745 | 12,661 | 20,759 | 4,819 | 25,578 |
| 2002 | 1,938 | 827 | 2,765 | 2,811 | 9,416 | 12,227 | 14,992 | 11,929 | 4,063 | 15,992 |
| 2003 | 834 | 919 | 1,753 | 7,856 | 30,011 | 37,867 | 39,620 | 22,754 | 4,592 | 27,346 |
| 2004 | 1,429 | 1,234 | 2,663 | 11,645 | 22,132 | 33,777 | 36,440 | 17,623 | 1,751 | 19,374 |
| 2005 | 247 | 317 | 564 | 5,243 | 1,909 | 7,152 | 7,716 | 3,048 | 304 | 3,352 |
| 2006 | 196 | 725 | 921 | 4,192 | 985 | 5,177 | 6,098 | 7,569 | 42 | 7,611 |
| 2007 | 270 | 2,336 | 2,606 | 2,019 | 2,472 | 4,491 | 7,097 | 8,987 | 502 | 9,489 |
| 2008 | 6,378 | 1,105 | 7,483 | 581 | 113 | 694 | 8,177 | 17,891 | 1,260 | 19,151 |
| 2009 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5,831 | 706 | 6,537 |
| 2010 | 36 | 113 | 149 | 889 | 1,482 | 2,371 | 2,520 | 16,630 | 1,134 | 17,764 |
| 2011 | 417 | 175 | 592 | 1,045 | 3,780 | 4,825 | 5,417 | 12,587 | 1,466 | 14,053 |
| 2012 | 334 | 2,085 | 2,419 | 759 | 2,960 | 3,719 | 6,138 | 23,285 | 1,718 | 25,003 |
| 2013 | 4,277 | 6,236 | 10,513 | 4,054 | 23,994 | 28,048 | 38,561 | 43,671 | 12,043 | 55,714 |
| 2014 | 1,292 | 1,434 | 2,726 | 19,822 | 8,977 | 28,799 | 31,525 | 21,303 | 3,404 | 24,707 |
| 2015 | 273 | 197 | 470 | 5,763 | 7,127 | 12,890 | 13,360 | 13,160 | 2,692 | 15,852 |
| 2016 | 0 | 56 | 56 | 633 | 1,571 | 2,204 | 2,260 | 3,966 | 870 | 4,836 |
| 2017 | 0 | 124 | 124 | 98 | 183 | 281 | 405 | 503 | 43 | 546 |
| 2018 | 637 | 91 | 728 | 927 | 852 | 1,779 | 2,507 | 1,815 | 179 | 1,994 |
| 2019 | 670 | 47 | 717 | 1,075 | 3,779 | 4,854 | 5,571 | 1,860 | 716 | 2,576 |
| 2020 | 53 | 0 | 53 | 228 | 3,064 | 3,292 | 3,345 | 2,209 | 568 | 2,777 |
| 2021 ^{a/} | 0 | 234 | 234 | 838 | 8,692 | 9,530 | 9,764 | 3,353 | 605 | 3,958 |
| 2022 ^{a/} | 0 | 323 | 323 | 637 | 13,708 | 14,345 | 14,668 | 4,003 | 485 | 4,488 |

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

| TABLE 10. Harvest levels and rates of age-3 Alaskan River Halibut (Page 5 of 7) | | | | | | | | | | |
|---|--|-------|----------|----------|----------|----------|-------------|---------------------|-------|-------|
| Year (t) or Average | Ocean Fisheries (Sept. 1 (t-1) - Aug. 31 (t)) | | | | | | | River Fisheries (t) | | |
| | KMZ | | | North of | South of | Subtotal | Ocean Total | Net | Sport | Total |
| | Troll | Sport | Subtotal | KMZ | KMZ | | | | | |
| HARVEST RATE ^{b/} | | | | | | | | | | |
| Age-3 | | | | | | | | | | |
| 1986-90 | 0.02 | 0.01 | 0.03 | 0.08 | 0.09 | 0.17 | 0.20 | 0.09 | 0.11 | 0.20 |
| 1991-95 | 0.00 | 0.01 | 0.01 | 0.01 | 0.02 | 0.03 | 0.03 | 0.13 | 0.06 | 0.18 |
| 1996-00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.03 | 0.03 | 0.14 | 0.07 | 0.21 |
| 2001 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.02 | 0.03 | 0.18 | 0.07 | 0.25 |
| 2002 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 | 0.02 | 0.12 | 0.07 | 0.19 |
| 2003 | 0.00 | 0.00 | 0.00 | 0.00 | 0.07 | 0.07 | 0.08 | 0.07 | 0.05 | 0.13 |
| 2004 | 0.00 | 0.01 | 0.01 | 0.06 | 0.05 | 0.11 | 0.12 | 0.14 | 0.06 | 0.20 |
| 2005 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.02 | 0.10 | 0.04 | 0.14 |
| 2006 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.13 | 0.00 | 0.13 |
| 2007 | 0.00 | 0.02 | 0.02 | 0.01 | 0.02 | 0.04 | 0.06 | 0.15 | 0.05 | 0.20 |
| 2008 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.17 | 0.03 | 0.21 |
| 2009 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.25 | 0.06 | 0.31 |
| 2010 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.28 | 0.04 | 0.33 |
| 2011 | 0.00 | 0.00 | 0.01 | 0.00 | 0.02 | 0.02 | 0.03 | 0.23 | 0.04 | 0.27 |
| 2012 | 0.00 | 0.01 | 0.02 | 0.00 | 0.02 | 0.02 | 0.03 | 0.29 | 0.05 | 0.34 |
| 2013 | 0.00 | 0.01 | 0.01 | 0.00 | 0.03 | 0.03 | 0.04 | 0.34 | 0.14 | 0.48 |
| 2014 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.03 | 0.03 | 0.06 | 0.03 | 0.09 |
| 2015 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.02 | 0.02 | 0.29 | 0.12 | 0.41 |
| 2016 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.11 | 0.05 | 0.16 |
| 2017 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 | 0.02 | 0.05 | 0.00 | 0.05 |
| 2018 | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.04 | 0.06 | 0.15 | 0.05 | 0.20 |
| 2019 | 0.00 | 0.00 | 0.01 | 0.00 | 0.03 | 0.03 | 0.04 | 0.14 | 0.15 | 0.29 |
| 2020 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.08 | 0.12 | 0.20 |
| 2021 ^{a/} | 0.00 | 0.00 | 0.00 | 0.01 | 0.05 | 0.05 | 0.05 | 0.13 | 0.05 | 0.18 |
| 2022 ^{a/} | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 0.06 | 0.06 | 0.12 | 0.06 | 0.18 |

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

| TABLE 10. Harvest levels and rates of age 3 and age 4 Atlantic River Herring (Page 10 of 17) | | | | | | | | | | |
|--|--|-------|----------|----------|----------|----------|---------------------|------|-------|-------|
| Year (t) or Average | Ocean Fisheries (Sept. 1 (t-1) - Aug. 31 (t)) | | | | | | River Fisheries (t) | | | |
| | KMZ | | | North of | South of | Subtotal | Ocean Total | Net | Sport | Total |
| | Troll | Sport | Subtotal | KMZ | KMZ | | | | | |
| HARVEST RATE ^{b/} | | | | | | | | | | |
| Age-4 | | | | | | | | | | |
| 1986-90 | 0.05 | 0.02 | 0.07 | 0.21 | 0.16 | 0.37 | 0.44 | 0.45 | 0.09 | 0.54 |
| 1991-95 | 0.00 | 0.01 | 0.01 | 0.05 | 0.06 | 0.11 | 0.13 | 0.29 | 0.04 | 0.34 |
| 1996-00 | 0.00 | 0.01 | 0.01 | 0.05 | 0.04 | 0.09 | 0.10 | 0.28 | 0.05 | 0.33 |
| 2001 | 0.01 | 0.01 | 0.02 | 0.04 | 0.03 | 0.07 | 0.09 | 0.24 | 0.05 | 0.29 |
| 2002 | 0.02 | 0.01 | 0.03 | 0.03 | 0.10 | 0.12 | 0.15 | 0.19 | 0.06 | 0.26 |
| 2003 | 0.00 | 0.00 | 0.01 | 0.04 | 0.16 | 0.20 | 0.21 | 0.24 | 0.05 | 0.28 |
| 2004 | 0.01 | 0.01 | 0.03 | 0.11 | 0.21 | 0.32 | 0.35 | 0.43 | 0.04 | 0.48 |
| 2005 | 0.01 | 0.01 | 0.01 | 0.14 | 0.05 | 0.19 | 0.20 | 0.17 | 0.02 | 0.19 |
| 2006 | 0.00 | 0.01 | 0.01 | 0.07 | 0.02 | 0.08 | 0.10 | 0.18 | 0.00 | 0.18 |
| 2007 | 0.01 | 0.07 | 0.08 | 0.06 | 0.07 | 0.13 | 0.21 | 0.53 | 0.03 | 0.56 |
| 2008 | 0.08 | 0.01 | 0.09 | 0.01 | 0.00 | 0.01 | 0.10 | 0.36 | 0.03 | 0.38 |
| 2009 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.36 | 0.04 | 0.40 |
| 2010 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.04 | 0.04 | 0.37 | 0.03 | 0.40 |
| 2011 | 0.01 | 0.00 | 0.01 | 0.02 | 0.06 | 0.07 | 0.08 | 0.31 | 0.04 | 0.34 |
| 2012 | 0.00 | 0.03 | 0.03 | 0.01 | 0.04 | 0.05 | 0.08 | 0.47 | 0.03 | 0.51 |
| 2013 | 0.02 | 0.03 | 0.05 | 0.02 | 0.12 | 0.14 | 0.20 | 0.40 | 0.11 | 0.51 |
| 2014 | 0.01 | 0.01 | 0.02 | 0.11 | 0.05 | 0.16 | 0.17 | 0.22 | 0.03 | 0.25 |
| 2015 | 0.00 | 0.00 | 0.01 | 0.09 | 0.12 | 0.21 | 0.22 | 0.39 | 0.08 | 0.47 |
| 2016 | 0.00 | 0.00 | 0.00 | 0.03 | 0.06 | 0.09 | 0.09 | 0.26 | 0.06 | 0.31 |
| 2017 | 0.00 | 0.01 | 0.01 | 0.01 | 0.02 | 0.03 | 0.04 | 0.07 | 0.01 | 0.08 |
| 2018 | 0.06 | 0.01 | 0.07 | 0.09 | 0.08 | 0.17 | 0.24 | 0.33 | 0.03 | 0.36 |
| 2019 | 0.04 | 0.00 | 0.05 | 0.07 | 0.24 | 0.31 | 0.36 | 0.27 | 0.10 | 0.38 |
| 2020 | 0.00 | 0.00 | 0.00 | 0.02 | 0.22 | 0.23 | 0.23 | 0.29 | 0.07 | 0.37 |
| 2021 | 0.00 | 0.01 | 0.01 | 0.02 | 0.25 | 0.27 | 0.28 | 0.19 | 0.03 | 0.22 |
| 2022 ^{a/} | 0.00 | 0.01 | 0.01 | 0.02 | 0.36 | 0.37 | 0.38 | 0.28 | 0.03 | 0.31 |

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 |
| 1977-80 | 1.0 | 2.3 | 2.2 | 0.2 | 5.7 | 0.23 | 0.55 | 14.1 | 6.5 | 0.5 | 21.1 |
| 1981-85 | 21.4 | 17.6 | 22.9 | 2.3 | 64.1 | 0.18 | 0.45 | 197.5 | 60.0 | 16.6 | 274.1 |
| 1986-90 | 30.8 | 47.2 | 37.5 | 4.5 | 120.0 | 0.20 | 0.44 | 485.0 | 112.0 | 30.3 | 627.2 |
| 1991-95 | 16.7 | 28.9 | 17.2 | 3.5 | 66.4 | 0.03 | 0.13 | 165.1 | 51.2 | 11.8 | 228.1 |
| 1996-00 | 15.1 | 31.2 | 18.2 | 4.6 | 69.1 | 0.03 | 0.10 | 199.1 | 66.6 | 13.6 | 279.3 |
| 2001 | 27.9 | 29.5 | 33.9 | 16.6 | 107.9 | 0.03 | 0.09 | 164.8 | 146.2 | 18.6 | 329.6 |
| 2002 | 43.8 | 64.1 | 63.1 | 30.6 | 201.6 | 0.02 | 0.15 | 337.9 | 70.0 | 28.4 | 436.3 |
| 2003 | 20.1 | 66.9 | 99.0 | 47.0 | 233.0 | 0.08 | 0.21 | 530.4 | 151.9 | 52.2 | 734.5 |
| 2004 | 20.3 | 30.6 | 69.5 | 35.4 | 155.8 | 0.12 | 0.34 | 243.3 | 158.4 | 82.5 | 484.2 |
| 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 | 0.17 | 295.5 | 40.5 | 49.0 | 385.0 |
| 2015 | 8.5 | 6.8 | 23.1 | 3.0 | 41.4 | 0.02 | 0.22 | 151.5 | 48.5 | 22.8 | 222.8 |
| 2016 | 17.7 | 8.1 | 17.7 | 2.9 | 46.4 | 0.01 | 0.09 | 102.6 | 16.2 | 17.6 | 136.4 |
| 2017 | 25.0 | 58.6 | 24.4 | 12.7 | 120.7 | 0.02 | 0.04 | 214.0 | 19.2 | 13.6 | 246.8 |
| 2018 | 23.9 | 27.7 | 11.4 | 0.4 | 63.4 | 0.06 | 0.24 | 303.0 | 138.8 | 21.0 | 462.8 |
| 2019 | 18.0 | 14.8 | 6.2 | 0.1 | 39.1 | 0.04 | 0.36 | 305.4 | 69.2 | 8.9 | 383.5 |
| 2020 | 17.5 | 24.1 | 8.0 | 0.1 | 49.6 | 0.01 ^{e/} | 0.23 | 217.2 | 35.1 | 4.6 | 256.9 |
| 2021 | 14.0 | 22.5 | 27.0 | 2.0 | 65.5 | 0.05 ^{e/} | 0.28 | 211.2 | 57.1 | 5.8 | 274.1 |
| 2022 | 15.4 | 11.3 | 7.4 | 0.9 | 35.0 | - | 0.4 | 173.4 | 53.5 | 20.0 | 246.9 |
| 2023 | NA | NA | NA | NA | NA | - | - | 185.8 ^{f/} | 26.9 ^{f/} | 5.6 ^{f/} | 218.3 ^{f/} |

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

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

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

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

e/ Preliminary, complete cohort not available.

f/ Preseason forecast.

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

| Year or Average | March Preseason Forecast ^{a/} | April STT Modeled Forecast ^{b/} | Postseason Return | March Pre/Postseason | April Pre/Postseason |
|--------------------|---|---|-------------------|-------------------------|-------------------------|
| URB | | | | | |
| 1984-85 | 124.6 | 126.1 | 163.9 | 0.75 | 0.76 |
| 1986-90 | 306.8 | 305.5 | 291.4 | 1.02 | 1.02 |
| 1991-95 | 86.2 | 91.5 | 105.3 | 0.83 | 0.87 |
| 1996-00 | 144.9 | 140.9 | 153.8 | 0.94 | 0.92 |
| 2001-05 | 266.6 | 260.3 | 303.9 | 0.88 | 0.87 |
| 2006 | 253.9 | 249.1 | 230.4 | 1.10 | 1.08 |
| 2007 | 182.4 | 185.2 | 112.6 | 1.62 | 1.64 |
| 2008 | 162.5 | 165.9 | 196.9 | 0.83 | 0.84 |
| 2009 | 259.9 | 269.8 | 212.0 | 1.23 | 1.27 |
| 2010 | 310.8 | 319.1 | 324.9 | 0.96 | 0.98 |
| 2011 | 398.2 | 399.5 | 324.1 | 1.23 | 1.23 |
| 2012 | 353.5 | 353.0 | 298.1 | 1.19 | 1.18 |
| 2013 | 432.5 | 434.7 | 784.1 | 0.55 | 0.55 |
| 2014 | 973.3 | 919.4 | 684.2 | 1.42 | 1.34 |
| 2015 | 500.3 | 516.2 | 795.9 | 0.63 | 0.65 |
| 2016 | 589.0 | 579.4 | 406.6 | 1.45 | 1.42 |
| 2017 | 260.0 | 275.1 | 297.1 | 0.88 | 0.93 |
| 2018 | 200.1 | 205.8 | 149.0 | 1.34 | 1.38 |
| 2019 | 158.4 | 162.6 | 212.2 | 0.75 | 0.77 |
| 2020 | 233.4 | 227.0 | 299.3 | 0.78 | 0.76 |
| 2021 | 354.2 | 349.2 | 239.9 | 1.48 | 1.46 |
| 2022 ^{c/} | 230.4 | 229.6 | 254.9 | 0.91 | 0.90 |
| 2023 | 272.4 | - | - | - | - |
| LRW | | | | | |
| 1984-85 | 14.8 | NA | 13.3 | 1.12 | NA |
| 1986-90 | 27.8 | 30.8 | 32.6 | 0.86 | 0.95 |
| 1991-95 | 13.9 | 13.2 | 14.8 | 0.99 | 0.93 |
| 1996-00 | 6.1 | 5.5 | 9.5 | 0.69 | 0.62 |
| 2001-05 | 20.9 | 21.2 | 21.1 | 1.01 | 1.03 |
| 2006 | 16.6 | 16.6 | 18.1 | 0.92 | 0.92 |
| 2007 | 10.1 | 10.0 | 4.3 | 2.35 | 2.33 |
| 2008 | 3.8 | 3.8 | 7.1 | 0.54 | 0.54 |
| 2009 | 8.5 | 8.6 | 7.5 | 1.13 | 1.15 |
| 2010 | 9.7 | 10.0 | 10.9 | 0.89 | 0.92 |
| 2011 | 12.5 | 13.1 | 15.2 | 0.82 | 0.86 |
| 2012 | 16.2 | 16.2 | 13.9 | 1.17 | 1.17 |
| 2013 | 14.2 | 14.3 | 25.8 | 0.55 | 0.55 |
| 2014 | 34.2 | 33.4 | 25.8 | 1.33 | 1.29 |
| 2015 | 18.9 | 19.4 | 32.4 | 0.58 | 0.60 |
| 2016 | 22.2 | 22.4 | 13.0 | 1.71 | 1.72 |
| 2017 | 12.5 | 13.6 | 7.8 | 1.60 | 1.74 |
| 2018 | 7.6 | 7.9 | 8.3 | 0.92 | 0.95 |
| 2019 | 13.7 | 14.1 | 16.6 | 0.83 | 0.85 |
| 2020 | 19.7 | 19.2 | 35.4 | 0.56 | 0.54 |
| 2021 | 20.0 | 20.4 | 16.9 | 1.18 | 1.21 |
| 2022 ^{c/} | 10.8 | 10.9 | 9.4 | 1.16 | 1.17 |
| 2023 | 8.6 | - | - | - | - |

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

| Year | March Preseason Forecast ^{a/} | April STT Modeled Forecast ^{b/} | Postseason Return | March Pre/Postseason | April Pre/Postseason |
|--------------------|---|---|-------------------|-------------------------|-------------------------|
| LRH | | | | | |
| 1984-85 | 76.0 | 87.9 | 106.7 | 0.71 | 0.83 |
| 1986-90 | 209.8 | 204.2 | 234.9 | 0.91 | 0.88 |
| 1991-95 | 67.2 | 72.2 | 55.5 | 1.18 | 1.28 |
| 1996-00 | 33.9 | 40.8 | 49.0 | 0.72 | 0.86 |
| 2001-05 | 87.4 | 87.6 | 118.6 | 0.73 | 0.73 |
| 2006 | 55.8 | 57.5 | 58.3 | 0.96 | 0.99 |
| 2007 | 54.9 | 54.4 | 32.7 | 1.68 | 1.66 |
| 2008 | 59.0 | 55.9 | 60.3 | 0.98 | 0.93 |
| 2009 | 88.8 | 88.2 | 76.7 | 1.16 | 1.15 |
| 2010 | 90.6 | 85.6 | 103.0 | 0.88 | 0.83 |
| 2011 | 133.5 | 128.9 | 109.0 | 1.22 | 1.18 |
| 2012 | 127.0 | 128.4 | 84.8 | 1.50 | 1.51 |
| 2013 | 88.0 | 87.4 | 103.2 | 0.85 | 0.85 |
| 2014 | 110.0 | 100.7 | 101.8 | 1.08 | 0.99 |
| 2015 | 94.9 | 96.8 | 128.7 | 0.74 | 0.75 |
| 2016 | 133.7 | 142.5 | 81.9 | 1.63 | 1.74 |
| 2017 | 92.4 | 98.8 | 64.6 | 1.43 | 1.53 |
| 2018 | 62.4 | 63.9 | 50.4 | 1.24 | 1.27 |
| 2019 | 54.5 | 55.1 | 48.9 | 1.11 | 1.13 |
| 2020 | 51.0 | 50.0 | 77.9 | 0.65 | 0.64 |
| 2021 | 73.1 | 73.8 | 74.7 | 0.98 | 0.99 |
| 2022 ^{c/} | 73.0 | 73.6 | 87.5 | 0.83 | 0.84 |
| 2023 | 77.1 | - | - | - | - |
| SCH | | | | | |
| 1984-85 | 28.1 | 32.1 | 40.4 | 0.75 | 0.85 |
| 1986-90 | 17.7 | 15.6 | 16.7 | 1.01 | 0.92 |
| 1991-95 | 31.0 | 34.5 | 30.2 | 1.05 | 1.18 |
| 1996-00 | 30.3 | 32.6 | 30.3 | 0.94 | 1.05 |
| 2001-05 | 110.0 | 113.1 | 148.5 | 0.76 | 0.78 |
| 2006 | 50.0 | 51.8 | 27.9 | 1.79 | 1.86 |
| 2007 | 21.8 | 21.3 | 14.5 | 1.50 | 1.47 |
| 2008 | 87.2 | 86.2 | 93.8 | 0.93 | 0.92 |
| 2009 | 59.3 | 56.5 | 49.0 | 1.21 | 1.15 |
| 2010 | 169.0 | 162.9 | 128.6 | 1.31 | 1.27 |
| 2011 | 116.4 | 116.7 | 70.5 | 1.65 | 1.66 |
| 2012 | 63.8 | 60.0 | 56.9 | 1.12 | 1.05 |
| 2013 | 38.0 | 36.7 | 86.7 | 0.44 | 0.42 |
| 2014 | 115.1 | 103.3 | 127.0 | 0.91 | 0.81 |
| 2015 | 160.5 | 163.9 | 166.4 | 0.96 | 0.98 |
| 2016 | 89.5 | 100.7 | 41.4 | 2.16 | 2.43 |
| 2017 | 158.4 | 164.4 | 48.1 | 3.29 | 3.42 |
| 2018 | 50.1 | 51.4 | 28.9 | 1.73 | 1.78 |
| 2019 | 46.0 | 48.4 | 29.0 | 1.59 | 1.67 |
| 2020 | 46.2 | 45.5 | 52.3 | 0.88 | 0.87 |
| 2021 | 46.8 | 47.3 | 73.7 | 0.64 | 0.64 |
| 2022 ^{c/} | 91.2 | 92.2 | 258.3 | 0.35 | 0.36 |
| 2023 | 136.1 | - | - | - | - |

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

| Year | March Preseason Forecast ^{a/} | April STT Modeled Forecast ^{b/} | Postseason Return | March Pre/Postseason | April Pre/Postseason |
|--------------------|---|---|-------------------|-------------------------|-------------------------|
| MCB | | | | | |
| 1991-95 | 34.6 | 35.6 | 32.4 | 1.08 | 1.10 |
| 1996-00 | 49.9 | 47.9 | 48.6 | 1.07 | 1.04 |
| 2001-05 | 84.9 | 82.0 | 110.1 | 0.77 | 0.75 |
| 2006 | 88.3 | 86.6 | 80.4 | 1.10 | 1.08 |
| 2007 | 68.0 | 69.1 | 46.9 | 1.45 | 1.47 |
| 2008 | 54.0 | 55.1 | 75.5 | 0.72 | 0.73 |
| 2009 | 94.4 | 97.9 | 73.1 | 1.29 | 1.34 |
| 2010 | 79.0 | 74.6 | 79.0 | 1.00 | 0.94 |
| 2011 | 100.0 | 100.4 | 85.4 | 1.17 | 1.18 |
| 2012 | 90.8 | 90.7 | 58.7 | 1.55 | 1.55 |
| 2013 | 105.2 | 96.3 | 243.4 | 0.43 | 0.40 |
| 2014 | 360.1 | 340.2 | 203.8 | 1.77 | 1.67 |
| 2015 | 113.3 | 116.9 | 170.6 | 0.66 | 0.69 |
| 2016 | 101.0 | 99.4 | 88.3 | 1.14 | 1.13 |
| 2017 | 45.6 | 48.3 | 47.4 | 0.96 | 1.02 |
| 2018 | 36.4 | 41.2 | 36.0 | 1.01 | 1.14 |
| 2019 | 56.7 | 66.4 | 58.1 | 0.98 | 1.14 |
| 2020 | 71.8 | 77.5 | 101.9 | 0.70 | 0.76 |
| 2021 | 77.4 | 85.0 | 66.0 | 1.17 | 1.29 |
| 2022 ^{c/} | 70.2 | 78.6 | 64.6 | 1.15 | 1.29 |
| 2023 | 48.3 | - | - | - | - |
| SUMMER | | | | | |
| 2008 | 52.0 | | 55.5 | 0.94 | |
| 2009 | 70.7 | | 53.9 | 1.31 | |
| 2010 | 88.8 | | 72.3 | 1.23 | |
| 2011 | 91.1 | | 80.6 | 1.13 | |
| 2012 | 91.2 | 92.6 | 58.3 | 1.56 | 1.59 |
| 2013 | 73.5 | 78.5 | 67.6 | 1.09 | 1.16 |
| 2014 | 67.5 | 64.7 | 78.3 | 0.86 | 0.83 |
| 2015 | 73.0 | 100.1 | 126.9 | 0.58 | 0.79 |
| 2016 | 93.3 | 95.6 | 91.0 | 1.03 | 1.05 |
| 2017 | 63.1 | 64.8 | 68.2 | 0.93 | 0.95 |
| 2018 | 67.3 | 70.5 | 42.1 | 1.60 | 1.67 |
| 2019 | 35.9 | 36.3 | 34.6 | 1.04 | 1.05 |
| 2020 | 38.3 | 38.0 | 65.5 | 0.58 | 0.58 |
| 2021 | 77.6 | 78.8 | 56.8 | 1.37 | 1.39 |
| 2022 ^{c/} | 57.5 | 56.3 | 78.5 | 0.73 | 0.72 |
| 2023 | 84.8 | - | - | - | - |

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 3)

| Year or Average | Preseason Forecast | Postseason Return | Pre/Post- season | Preseason Forecast | Postseason Return | Pre/Post- season | Preseason Forecast | Postseason Return | Pre/Post- season | Preseason Forecast | Postseason Return | Pre/Post- season |
|---|-----------------------|----------------------|---------------------|------------------------------------|----------------------|---------------------|---|----------------------|---------------------|---------------------------|----------------------|---------------------|
| Nooksack-Samish Hatchery and Natural | | | | East Sound Bay Hatchery | | | Skagit^{b/} Hatchery | | | Skagit Natural | | |
| | | | | | | | | | | | | |
| 1993-95 | 45.2 | 27.9 | 1.63 | 3.3 | 1.6 | 15.40 | 1.3 | 3.4 | 0.47 | 9.1 | 7.3 | 1.33 |
| 1996-00 | 27.0 | 36.2 | 0.75 | 2.1 | 0.5 | 9.58 | 0.2 | 0.3 | 0.38 | 7.0 | 10.9 | 0.81 |
| 2001 | 34.9 | 66.5 | 0.52 | 1.6 | 0.9 | 1.85 | 0.0 | 0.2 | 0.00 | 9.1 | 14.0 | 0.65 |
| 2002 | 52.8 | 56.5 | 0.93 | 1.6 | 0.9 | 1.87 | 0.0 | 0.1 | 0.00 | 13.8 | 19.9 | 0.69 |
| 2003 | 45.8 | 29.9 | 1.53 | 1.6 | 0.2 | 7.51 | 0.0 | 0.3 | 0.00 | 13.7 | 10.1 | 1.36 |
| 2004 | 34.2 | 17.1 | 2.00 | 0.8 | 0.0 | 400.00 | 0.5 | 0.2 | 2.16 | 20.3 | 24.1 | 0.84 |
| 2005 | 19.5 | 16.6 | 1.17 | 0.4 | 0.1 | 7.69 | 0.7 | 0.4 | 1.88 | 23.4 | 23.4 | 1.00 |
| 2006 | 16.9 | 31.9 | 0.53 | 0.4 | 0.0 | 26.67 | 0.6 | 0.4 | 1.51 | 24.1 | 22.5 | 1.07 |
| 2007 | 18.8 | 26.6 | 0.71 | 0.4 | 0.0 | - | 1.1 | 0.4 | 2.59 | 15.0 | 12.9 | 1.16 |
| 2008 | 35.3 | 29.1 | 1.21 | 0.8 | 0.0 | - | 0.7 | 0.2 | 3.32 | 23.8 | 15.0 | 1.59 |
| 2009 | 23.0 | 20.9 | 1.10 | 0.1 | 0.0 | 4.76 | 0.6 | 0.1 | 4.48 | 23.4 | 12.1 | 1.93 |
| 2010 | 30.3 | 36.3 | 0.84 | 2.3 | 0.7 | 3.19 | 0.9 | 0.1 | 10.59 | 13.0 | 9.7 | 1.34 |
| 2011 | 37.5 | 33.5 | 1.12 | 0.4 | 0.7 | 0.57 | 1.5 | 0.1 | 13.51 | 14.3 | 9.2 | 1.55 |
| 2012 | 44.0 | 33.7 | 1.30 | 0.4 | 1.6 | 0.25 | 1.3 | 0.1 | 13.83 | 8.3 | 15.8 | 0.53 |
| 2013 | 47.2 | 32.9 | 1.43 | 2.0 | 1.1 | 1.79 | 0.3 | 0.1 | 3.45 | 12.9 | 13.0 | 0.99 |
| 2014 | 43.9 | 25.7 | 1.71 | 1.2 | 0.4 | 3.23 | 0.3 | 0.1 | 2.78 | 18.0 | 12.0 | 1.50 |
| 2015 | 38.6 | 18.8 | 2.06 | 1.2 | 0.9 | 1.39 | 0.6 | 0.1 | 5.94 | 11.8 | 14.7 | 0.80 |
| 2016 | 27.9 | 15.9 | 1.76 | 0.7 | 0.7 | 1.05 | 0.4 | 0.1 | 4.49 | 15.1 | 21.1 | 0.72 |
| 2017 | 21.2 | 18.9 | 1.12 | 0.8 | 0.5 | 1.70 | 0.4 | 0.1 | 3.96 | 15.8 | 14.0 | 1.13 |
| 2018 | 24.6 | 17.2 | 1.43 | 0.7 | 0.0 | 63.64 | 0.3 | 0.1 | 3.09 | 13.3 | 12.3 | 1.09 |
| 2019 | 21.3 | 14.2 | 1.51 | 0.3 | 0.0 | - | 0.3 | 0.1 | 3.09 | 13.6 | 13.1 | 1.04 |
| 2020 | 18.2 | 14.7 | 1.24 | 0.3 | 0.0 | - | 0.5 | 0.1 | 5.27 | 12.9 | 13.3 | 0.97 |
| 2021 ^{c/} | 18.9 | 27.9 | 0.68 | 0.6 | 0.0 | 612.00 | 0.5 | 0.1 | 3.80 | 10.5 | 8.5 | 1.23 |
| 2022 | 28.1 | - | - | 0.4 | - | - | 0.5 | - | - | 12.5 | - | - |
| 2023 | 41.2 | - | - | 0.2 | - | - | 0.5 | - | - | 12.2 | - | - |

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 3)

| Year or Average | Preseason Forecast | Postseason Return | Pre/Post- season | Preseason Forecast | Postseason Return | Pre/Post- season | Preseason Forecast | Postseason Return | Pre/Post- season | Preseason Forecast | Postseason Return | Pre/Post- season |
|--|-----------------------|----------------------|---------------------|-------------------------------------|----------------------|---------------------|------------------------------------|----------------------|---------------------|-----------------------------------|----------------------|---------------------|
| Stillaguamish ^{d/} Natural | | | | Snohomish ^{d/} Hatchery | | | Snohomish ^{d/} Natural | | | Tulalip ^{d/} Hatchery | | |
| 1993-95 | 1.8 | 1.3 | 1.29 | 2.0 | 3.8 | 0.43 | 4.6 | 4.0 | 1.15 | 2.6 | 5.2 | 0.58 |
| 1996-00 | 1.6 | 2.0 | 0.82 | 7.0 | 8.1 | 0.93 | 5.3 | 3.5 | 1.64 | 3.7 | 9.5 | 0.43 |
| 2001 | 1.7 | 2.0 | 0.86 | 4.1 | 2.9 | 1.43 | 5.8 | 6.7 | 0.86 | 5.5 | 4.8 | 1.14 |
| 2002 | 2.0 | 2.2 | 0.90 | 6.8 | 2.6 | 2.60 | 6.7 | 7.4 | 0.90 | 5.8 | 5.2 | 1.11 |
| 2003 | 2.0 | 1.5 | 1.32 | 9.4 | 6.0 | 1.57 | 5.5 | 5.8 | 0.95 | 6.0 | 8.6 | 0.70 |
| 2004 | 3.3 | 2.1 | 1.55 | 10.1 | 6.4 | 1.58 | 15.7 | 11.0 | 1.42 | 6.8 | 5.5 | 1.24 |
| 2005 | 2.0 | 1.7 | 1.20 | 9.9 | 4.0 | 2.49 | 14.2 | 5.0 | 2.86 | 6.4 | 6.9 | 0.93 |
| 2006 | 1.6 | 1.8 | 0.87 | 9.6 | 5.9 | 1.62 | 8.7 | 7.2 | 1.21 | 9.3 | 5.1 | 1.84 |
| 2007 | 1.9 | 1.1 | 1.73 | 8.7 | 8.1 | 1.08 | 12.3 | 2.8 | 4.33 | 8.4 | 5.4 | 1.56 |
| 2008 | 1.1 | 2.1 | 0.53 | 8.8 | 7.4 | 1.20 | 6.5 | 7.1 | 0.92 | 2.7 | 3.5 | 0.77 |
| 2009 | 1.7 | 1.2 | 1.38 | 4.9 | 2.5 | 1.95 | 8.4 | 1.8 | 4.58 | 4.0 | 1.7 | 2.32 |
| 2010 | 1.4 | 1.5 | 0.91 | 5.6 | 3.4 | 1.65 | 9.9 | 3.5 | 2.81 | 3.4 | 3.6 | 0.94 |
| 2011 | 1.8 | 1.6 | 1.13 | 5.2 | 3.3 | 1.58 | 7.4 | 1.4 | 5.21 | 3.5 | 5.1 | 0.68 |
| 2012 | 0.9 | 1.9 | 0.46 | 3.9 | 8.4 | 0.47 | 2.8 | 3.4 | 0.83 | 5.9 | 0.4 | 16.16 |
| 2013 | 1.3 | 1.7 | 0.79 | 5.9 | 5.7 | 1.04 | 3.6 | 2.7 | 1.34 | 10.9 | 1.8 | 6.22 |
| 2014 | 1.6 | 0.9 | 1.81 | 5.4 | 6.1 | 0.89 | 5.3 | 2.4 | 2.21 | 4.7 | 1.7 | 2.83 |
| 2015 | 0.5 | 0.9 | 0.58 | 3.3 | 4.8 | 0.68 | 4.2 | 2.3 | 1.79 | 1.3 | 2.1 | 0.60 |
| 2016 | 0.5 | 1.2 | 0.41 | 5.0 | 10.0 | 0.50 | 3.3 | 3.5 | 0.95 | 1.4 | 6.0 | 0.23 |
| 2017 | 1.5 | 1.3 | 1.19 | 4.8 | 9.0 | 0.53 | 3.4 | 4.4 | 0.78 | 5.3 | 11.4 | 0.47 |
| 2018 | 1.6 | 1.2 | 1.35 | 6.5 | 6.0 | 1.09 | 3.5 | 3.3 | 1.06 | 7.5 | 9.3 | 0.80 |
| 2019 | 0.9 | 1.1 | 0.78 | 7.0 | 6.2 | 1.13 | 3.2 | 1.1 | 3.00 | 12.5 | 8.7 | 1.43 |
| 2020 | 0.9 | 1.6 | 0.56 | 6.8 | 5.3 | 1.28 | 3.0 | 2.8 | 1.05 | 6.0 | 3.4 | 1.78 |
| 2021 ^{c/} | 0.9 | 0.9 | 1.07 | 6.1 | 6.2 | 0.98 | 2.9 | 2.1 | 1.42 | 5.8 | 2.1 | 2.79 |
| 2022 | 0.9 | - | - | 6.0 | - | - | 2.4 | - | - | 7.7 | - | - |
| 2023 | 1.2 | - | - | 7.5 | - | - | 3.4 | - | - | 5.5 | - | - |

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 3)

| Year or Average | Preseason Forecast | Postseason Return | Pre/Post- season | Preseason Forecast | Postseason Return | Pre/Post- season | Preseason Forecast | Postseason Return | Pre/Post- season | Preseason Forecast | Postseason Return | Pre/Post- season |
|-------------------------------|-----------------------|----------------------|---------------------|------------------------------|----------------------|---------------------|--|----------------------|---------------------|------------------------------------|----------------------|---------------------|
| South Puget Sound Hatchery | | | | South Puget Sound Natural | | | Strait of Juan de Fuca Hatchery and Natural | | | Hood Canal Hatchery and Natural | | |
| 1993-95 | 54.7 | 70.8 | 0.83 | 22.1 | 13.5 | 1.78 | 4.2 | 2.3 | 1.88 | 11.6 | 6.3 | 2.09 |
| 1996-00 | 64.3 | 72.6 | 0.93 | 19.2 | 14.7 | 1.31 | 3.0 | 3.5 | 0.89 | 7.3 | 16.3 | 0.54 |
| 2001 | 73.7 | 105.4 | 0.70 | 16.2 | 19.6 | 0.83 | 3.5 | 3.7 | 0.96 | 19.2 | 26.1 | 0.74 |
| 2002 | 90.8 | 104.3 | 0.87 | 16.9 | 19.9 | 0.85 | 3.6 | 3.7 | 0.96 | 25.3 | 30.2 | 0.84 |
| 2003 | 86.6 | 89.9 | 0.96 | 19.6 | 6.0 | 3.26 | 3.4 | 4.1 | 0.84 | 24.0 | 33.0 | 0.73 |
| 2004 | 86.5 | 95.6 | 0.90 | 17.5 | 10.4 | 1.68 | 3.6 | 5.4 | 0.66 | 29.6 | 34.3 | 0.86 |
| 2005 | 83.1 | 86.2 | 0.96 | 17.7 | 5.7 | 3.10 | 4.2 | 3.7 | 1.12 | 30.6 | 54.6 | 0.56 |
| 2006 | 85.8 | 129.9 | 0.66 | 21.3 | 9.1 | 2.34 | 4.2 | 4.6 | 0.91 | 30.2 | 39.8 | 0.76 |
| 2007 | 83.0 | 161.3 | 0.51 | 17.0 | 11.0 | 1.54 | 4.4 | 2.1 | 2.07 | 47.5 | 32.4 | 1.46 |
| 2008 | 101.6 | 109.7 | 0.93 | 21.1 | 14.9 | 1.42 | 3.2 | 1.9 | 1.69 | 36.8 | 33.4 | 1.10 |
| 2009 | 93.0 | 85.0 | 1.09 | 17.2 | 2.7 | 6.28 | 2.4 | 4.4 | 0.54 | 42.6 | 38.1 | 1.12 |
| 2010 | 97.4 | 92.0 | 1.06 | 12.7 | 4.0 | 3.16 | 1.9 | 2.9 | 0.65 | 45.0 | 37.8 | 1.19 |
| 2011 | 118.6 | 82.3 | 1.44 | 8.9 | 3.3 | 2.74 | 2.5 | 4.1 | 0.61 | 40.6 | 62.9 | 0.65 |
| 2012 | 95.8 | 78.5 | 1.22 | 8.9 | 5.5 | 1.61 | 2.9 | 4.3 | 0.68 | 46.8 | 85.6 | 0.55 |
| 2013 | 102.0 | 86.6 | 1.18 | 5.0 | 4.4 | 1.15 | 4.3 | 6.4 | 0.67 | 66.2 | 71.8 | 0.92 |
| 2014 | 96.7 | 41.9 | 2.31 | 4.8 | 3.2 | 1.51 | 5.3 | 6.9 | 0.76 | 84.1 | 30.8 | 2.73 |
| 2015 | 62.4 | 50.4 | 1.24 | 3.8 | 5.3 | 0.71 | 8.4 | 7.3 | 1.15 | 62.1 | 37.4 | 1.66 |
| 2016 | 43.1 | 85.9 | 0.50 | 4.5 | 6.6 | 0.68 | 6.6 | 4.5 | 1.48 | 45.0 | 69.7 | 0.65 |
| 2017 | 80.4 | 146.0 | 0.55 | 4.7 | 8.7 | 0.54 | 4.6 | 5.0 | 0.92 | 50.8 | 111.0 | 0.46 |
| 2018 | 123.6 | 110.8 | 1.12 | 4.8 | 7.3 | 0.66 | 7.4 | 10.3 | 0.72 | 61.4 | 75.4 | 0.82 |
| 2019 | 99.9 | 93.9 | 1.06 | 8.4 | 5.5 | 1.53 | 8.3 | 10.4 | 0.80 | 67.2 | 66.2 | 1.02 |
| 2020 | 100.7 | 60.3 | 1.67 | 5.8 | 5.7 | 1.02 | 5.0 | 5.4 | 0.91 | 72.2 | 32.8 | 2.20 |
| 2021 ^{c/} | 78.8 | 89.3 | 0.88 | 7.0 | 6.3 | 1.11 | 5.5 | 5.5 | 0.99 | 69.8 | 59.9 | 1.16 |
| 2022 | 90.3 | - | - | 6.9 | - | - | 5.0 | - | - | 57.3 | - | - |
| 2023 | 90.4 | - | - | 7.0 | - | - | 3.7 | - | - | 56.8 | - | - |

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 do not include hatchery strays to the spawning grounds.

c/ Postseason returns are preliminary.

d/ Preseason forecasts include a variety of runsize types including escapement without fishing and terminal run. Postseason returns 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, and the Stillaguamish and Snohomish Rivers, harvest in sport fisheries in Area 8D, and the Stillaguamish and Snohomish River escapements.

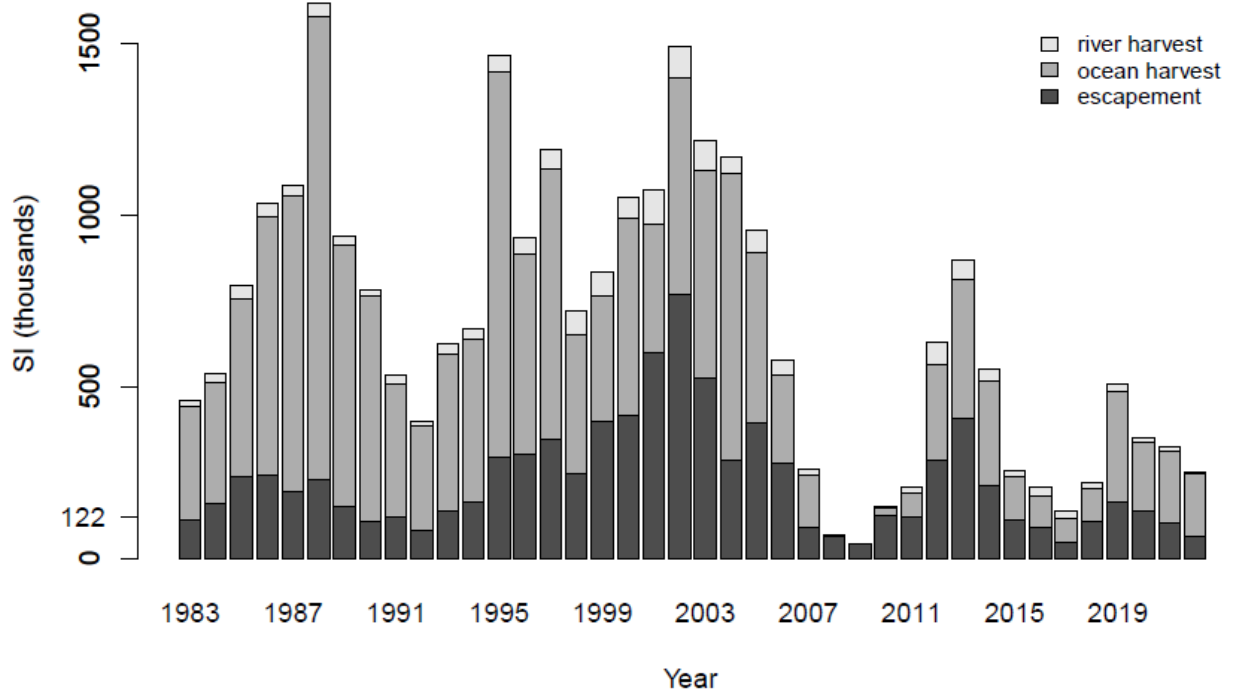
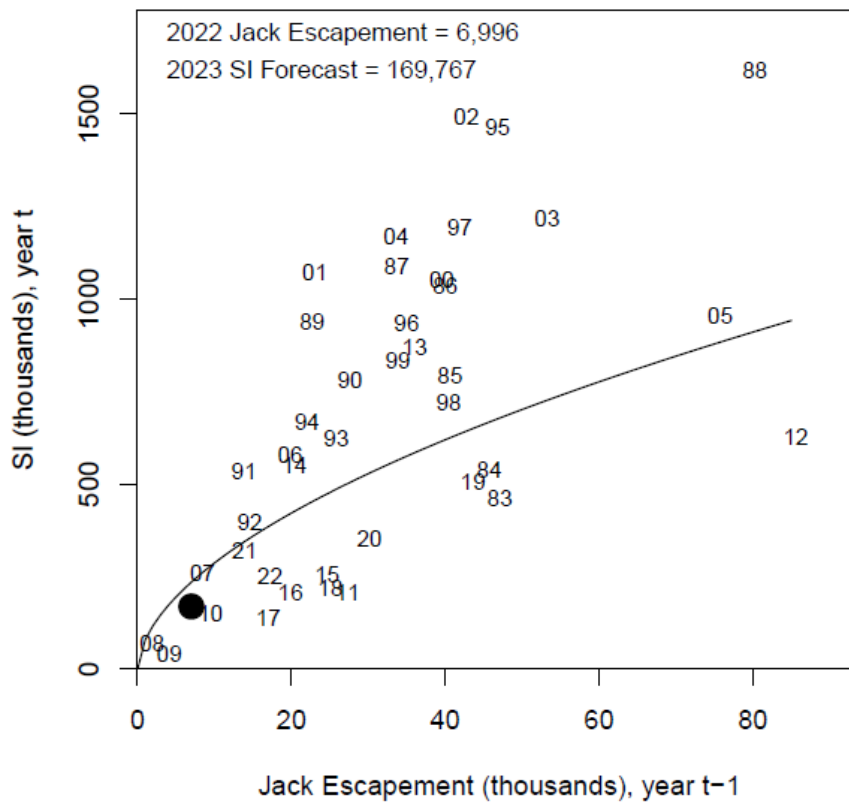


FIGURE II-1. The Sacramento Index (SI) and relative levels of its components. The Sacramento River fall Chinook S_{MSY} of 122,000 adult spawners is noted on the vertical axis.



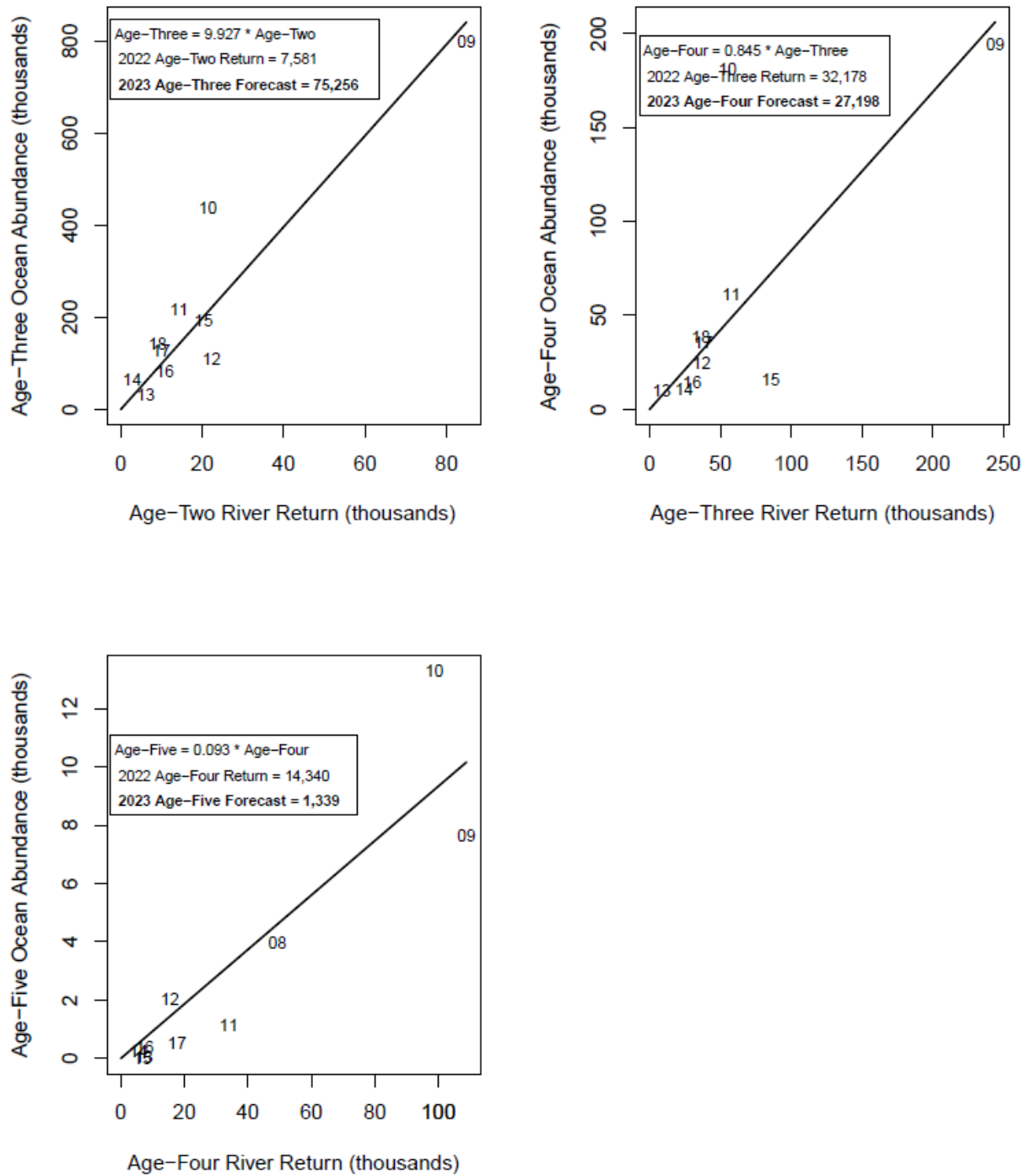


FIGURE II-3. Regression estimators for Klamath River fall Chinook ocean abundance (September 1) based on that year's river return of same cohort. Numbers in plots denote brood years.

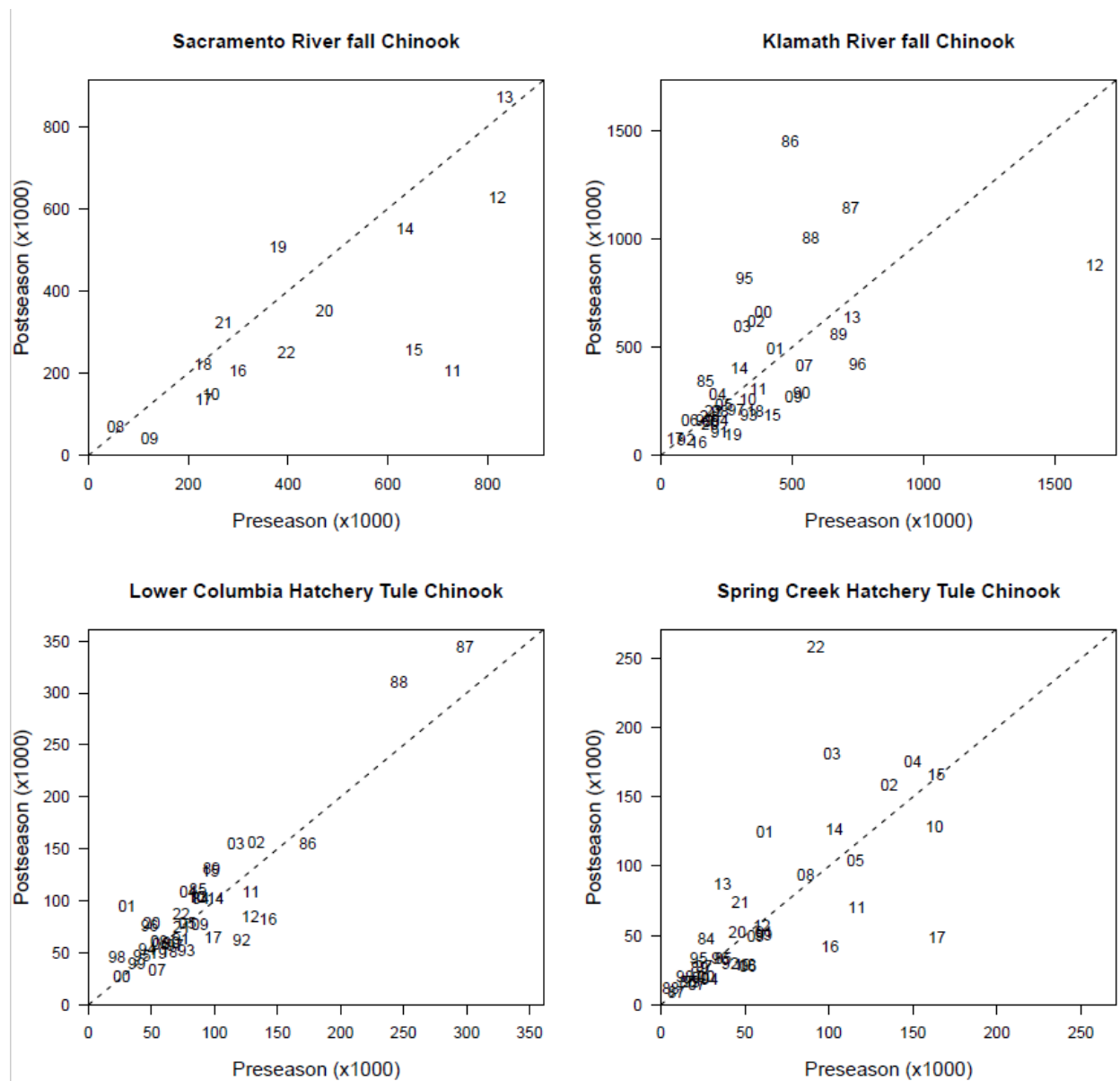


FIGURE II-4. Selected preseason vs. postseason forecasts for Chinook stocks with substantial contribution to Council area fisheries.

CHAPTER III - COHO SALMON ASSESSMENT

COLUMBIA RIVER AND OREGON/CALIFORNIA COAST COHO

3.1 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) Columbia River, coastal Oregon, and northern California public hatchery (OPIH), (2) Oregon coastal natural (OCN), including river and lake components, and (3) Lower Columbia natural (LCN). Direct comparisons of 2023 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 postseason 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 some recent years, fisheries to the south have been more restricted than those to the north, leading to underestimation of harvest of OPI area stocks. In addition, the estimation technique was not consistent with the methods used in Coho FRAM. The Mixed Stock Model (MSM) 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. MSM is based on CWT recoveries (release years 1986-1992) and associated tag rates. FRAM 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 Backwards FRAM (BKFRAM) run reconstructions. BKFRAM is used to estimate the pre-fishing abundances and post-season exploitation rates of OPI stocks. FRAM is populated with post-season estimates of escapements and catches/non-retention mortalities for OPI fisheries. When run in BKFRAM mode, stock specific mortalities are added to escapements to reconstruct pre-fishing abundances and to estimate exploitation rates.

3.1.1 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) 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

The adult return for the OPIH component is forecast using fish data from public hatcheries in Washington, Oregon, and California. The present OPIH forecast approach has been used since 1996. 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.

Since 2011, the longer time series was used with the exception of 1983 which was excluded due to El Niño impacts. The OPIH stock predictor is partitioned into Columbia River early and late stocks based on the proportion of the 2022 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 2023 partition was based on the proportion of the smolt releases in 2022.

For the 2023 abundance forecast the regression includes recruits from 1970-2022 and jack returns and smolt production from 1969-2021. The 2023 abundance is predicted using jack returns and smolt releases from 2022. The model was:

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

Where:

$$\begin{aligned} a &= 18.57 \\ b &= 31.63 \\ c &= -111.18 \\ \text{adjusted } r^2 &= 0.91 \end{aligned}$$

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 and Figure III-1a. The 2022 preseason abundance prediction of 1,003,500 OPIH coho was 144 percent of the preliminary postseason estimate of 696,000 coho.

Stock Forecast and Status

Using the appropriate values from Appendix C, Table C-2, the OPIH abundance forecast for 2023 is 896,900 coho, 89 percent of the 2022 preseason abundance prediction and 129 percent of the preliminary 2022 postseason estimate.

3.1.2 Oregon Coastal Natural Coho

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

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

Predictor Description

3.1.2.1.1 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.

Specifically, the final estimate is the mean of six GAM estimates, each with three predictor variables. The individual GAMs can be expressed in the following general form:

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

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

The ensemble mean predictor used for the 2023 forecast was the geometric mean of the six GAM predictors:

Ensemble Mean of the six predictors based on environmental conditions and spawners.

| Variables | | | Prediction | r^2 | OCV ^{a/} |
|----------------------------|--|--|-------------------|-------|-------------------|
| PDO | Spring Transition (Julian date; t-1) | Log Spawners (t-3) | 233,689 | 0.62 | 0.49 |
| PDO | Multivariate ENSO Index (Oct-Dec; t-1) | Upwelling (July-Sept; t-1) | 276,640 | 0.68 | 0.58 |
| PDO | Spring Transition (Julian date; t-1) | Multivariate ENSO Index (Oct-Dec; t-1) | 262,603 | 0.65 | 0.57 |
| PDO | Upwelling (July-Sept; t-1) | Sea Surface Temperature (May-Jul; t-1) | 217,788 | 0.63 | 0.51 |
| PDO | Sea Surface Height (Apr-June; t-1) | Upwelling (July-Sept; t-1) | 227,216 | 0.67 | 0.53 |
| PDO | Upwelling (Sept-Nov; t-1) | Sea Surface Temperature (Jan; t) | 159,807 | 0.63 | 0.50 |
| Ensemble Mean | | | 226,284 | 0.68 | 0.58 |
| (90% prediction intervals) | | | (103,870-480,191) | | |

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.

3.1.2.1.2 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 (Tennile, Siltcoos, and Tahkenitch). Following the same reasoning used for the OCN Rivers predictor in 2008, OPITT chose to use the 2007 postseason abundance estimate of 10,000 coho for the 2008 preseason prediction instead of using the most recent three-year average. For 2023, the OCNL forecast is 12,500, based on most recent three-year average adult stock abundance.

Predictor Performance

Recent year OCN preseason abundance predictions are compared to postseason estimates in Table III-1. The 2022 preseason abundance prediction of 222,400 OCN coho was 116 percent of the preliminary postseason estimate of 191,500 coho

Stock Forecasts and Status

The 2023 preseason prediction for OCN (river and lake systems combined) is 238,800 coho, 107 percent of the 2022 preseason prediction and 125 percent of the 2022 postseason estimate (Table III-1). The 2023 preseason prediction for OCNR and OCNL components are 226,300 and 12,500 coho, respectively.

Based on parent escapement levels and observed OPI smolt-to-jack survival for 2020 brood OPI smolts, the total allowable OCN coho exploitation rate for 2023 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 2014². Based on this methodology, the marine survival index of 7.9 percent and the parent escapement levels, allows for a total allowable exploitation rate for 2023 fisheries that is no greater than 20.0 percent (Table V-8; Appendix Table A-4).

3.1.3 Southern Oregon / Northern California Coast Coho

The SONCC coho ESU consists of all naturally produced populations of coho from coastal streams between Cape Blanco, OR and Punta Gorda, CA. Under the FMP, ESA consultation standards are used to manage ESA-listed stocks, including SONCC coho and CCC coho.

Under FMP Amendment 22, the harvest control rule was revised to include (1) a total fishery (marine and freshwater) exploitation rate limit of 15.0 percent for all populations within the SONCC ESU, except the Trinity River coho populations, and (2) a total fishery exploitation rate limit of 16.0 percent for the Trinity River coho populations.

3.1.4 Lower Columbia River Natural

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

Predictor Description

The LCN stock predictor methodology was developed in 2007.

The 2023 predictions for the Oregon LCN coho populations are derived by the recent 3-year average abundances based on spawning ground counts. The 2023 adult abundance forecast for Oregon LCN coho is 19,700.

² 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.

The 2023 predictions for the Washington LCN coho populations are derived by combining estimates of the 2020 brood year natural smolt production based on watershed area and the marine survival rate of 4.3 percent. The 2023 adult abundance forecast for Washington LCN coho is 25,800.

Predictor Performance

The preseason abundance compared to the postseason estimate is presented in Table III-1. The 2022 preseason abundance prediction of 65,700 LCN coho was 90 percent of the preliminary postseason estimate of 73,100 coho.

Stock Forecast and Status

The 2023 prediction for LCN coho is 45,500 coho (Table III-1). This abundance estimate includes both Oregon and Washington LCN components.

NMFS ESA guidance for harvest of LCN coho in marine and mainstem Columbia River fisheries is based on a matrix describing parent escapement levels for multiple populations and the observed Columbia River OPI smolt-to-jack survival rate. Based on this matrix, the total allowable marine and mainstem Columbia River exploitation rate for LCN coho in 2023 fisheries would be no more than 23.0 percent.

3.1.5 Oregon Production Index Area Summary of Forecasts

The 2023 combined OPI area stock abundance is predicted to be 1,135,700 coho, which is 93 percent of the 2022 preseason prediction of 1,225,900 coho, and 128 percent of the 2022 preliminary postseason estimate of 887,500 coho. The historical OPI abundances are reported in Table III-2.

3.2 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 OA3 forecasts with postseason estimates derived from run reconstructions using FRAM (“Backwards” mode, BKFRAM) to expand observed escapements to ocean abundance from CWT recovery data. It should be noted that forecast methodology has changed over time, and the overall trends and biases may not reflect the current methods.

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

3.2.1 Willapa Bay

Predictor Description

Willapa Bay natural coho ocean abundance predictions were generated with the auto-regressive (AR1) and spatio-temporal integrated population model (STIPM) state-space models presented for SSC review in

October 2021 and built from the work of DeFilippo et al 2021. These approaches base estimates on the series of past total returns (AR1) and a simplified life cycle model (returning spawners give rise to smolts, which are subject to marine survival and harvest). The 2023 forecast value is the weighted average of the AR1 and STIPM posterior medians, with weights defined by the inverse of lag-1 median symmetric accuracy (MSA) skill that were presented at the October 2021 Salmon Methodology Review.

The hatchery forecast was calculated using a recent 3-year average terminal marine survival (3.86 percent) applied to the estimated 2020 brood year smolts (1,954,458) released in the spring of 2022 from all Willapa Bay hatchery facilities. The terminal runsize was expanded to OA3 using a 0.32 exploitation rate expansion factor for the ocean fisheries from CWT recoveries for Willapa Bay. The pre-terminal impact rate was evaluated looking at CWT recoveries from Willapa Bay.

Predictor Performance

Forecast performance can be assessed, in part, by examining the differences between preseason forecasts and postseason estimates (Table III-3; Figure III-1a). In 2021, the preseason forecast was 64 percent of the postseason estimate.

Stock Forecasts and Status

The 2023 natural coho OA3 abundance forecast is 42,663, compared to a 2022 preseason forecast of 35,776.

The 2023 Willapa Bay hatchery coho OA3 abundance forecast is 110,954 compared to a 2022 preseason forecast of 74,707.

OFL, ABC, and ACL

The OFL, ABC, and ACL are defined in terms of spawner escapement (S_{OFL} , S_{ABC} , and S_{ACL}), and are calculated using potential spawner abundance forecasts and established exploitation rates. Potential Willapa Bay coho natural area spawner abundance was derived by adding the current forecast of natural origin coho OA3 abundance, 42,663, to the predicted abundance of OA3 hatchery origin coho spawning in natural areas. The forecast of OA3 naturally spawning, hatchery origin coho is 16,754 and was calculated by multiplying the OA3 hatchery coho abundance forecast, 110,954, by the most recent 3-year average stray rate (0.151). Annual stray rates were estimated by dividing the number of hatchery origin spawners in natural areas by the number of hatchery origin river mouth returns. Stray rates in 2019, 2020, and 2021 were 0.158, 0.119, and 0.175, respectively.

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 $S_{OFL} = 59,417 \times (1 - 0.74) = 15,448$. 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 $S_{ABC} = 59,417 \times (1 - 0.70) = 17,825$, with $S_{ACL} = S_{ABC}$. These preseason estimates will be recalculated with postseason abundance estimates (when available) to assess ACL and OFL compliance.

3.2.2 Grays Harbor

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

Predictor Description

The natural forecast is the sum of the Chehalis River natural, Humptulips River natural, and South Bay tributary natural forecasts. An OA3 coho marine survival prediction was developed by dividing the

Quinault Department of Fisheries prediction of Queets coho JA3 marine survival by the natural mortality rate of 1.23169. The Chehalis wild coho smolt production estimate was developed by scaling the 2022 Queets River natural coho smolt production to the Chehalis River production based on the relationship between the Backward FRAM (BKFRAM) OA3 ocean abundances of Queets and Chehalis natural coho abundances during the past 15 years. The Humptulips and South Bay tributary forecasts are based on recruit densities scaled from Clearwater and Chehalis basins, respectively.

The hatchery forecast is the sum of the Chehalis River, Humptulips River, and Grays Harbor net pen and off-site hatchery program hatchery-origin forecasts. The Chehalis River, Humptulips River, and Grays Harbor net-pen and off-site hatchery program hatchery-origin forecasts were based on Bingham Creek hatchery tag recoveries for brood year released 2013-2016 (most recent full complement of tag code recoveries, 9.81 percent of the tags recovered pre-terminally).

Predictor Performance

Forecast performance can be assessed, in part, by examining the differences between preseason forecasts and postseason estimates (Table III-3; Figure III-1a). In 2021, the preseason forecast was 58 percent of the postseason estimate.

Stock Forecasts and Status

The 2023 Grays Harbor natural OA3 abundance forecast is 102,841, compared to a 2022 preseason forecast of 120,381. This ocean abundance results in classification of this stock's status as "Abundant" under the 2019 PST Southern Coho Management Plan (Table III-5).

The 2023 Grays Harbor hatchery coho OA3 abundance forecast is 111,430, compared to a 2022 preseason forecast of 78,338.

OFL

The OFL is defined in terms of spawner escapement (S_{OFL}). Potential Grays Harbor coho natural area spawner abundance was derived by adding the current forecast of natural origin coho OA3 abundance, 102,841, to the predicted abundance of OA3 hatchery origin coho spawning in natural areas. The forecast of OA3 naturally spawning hatchery origin coho is 10,586 and was calculated by multiplying the OA3 hatchery coho abundance forecast, 111,430, by the most recent 5-year average stray rate (2017-2021 average = 0.095). Annual stray rates were estimated by dividing the number of hatchery origin spawners in natural areas by the total hatchery origin escapement. For Grays Harbor natural coho $MFMT = 0.65$ and the OFL is $S_{OFL} = 113,427 \times (1 - 0.65) = 39,699$. The preseason S_{OFL} will also be recalculated with postseason abundance estimates (when available) to assess OFL compliance.

3.2.3 Quinault River

Predictor Description

The 2023 Quinault natural coho forecast is the recent 5 year average JA3 abundance calculated from PSC post season FRAM modeling.

The hatchery forecast is calculated by multiplying the smolt releases from the Quinault (Cook Creek) Hatchery (675,977 adipose clipped smolts) by a forecasted marine survival rate of 4.5218 percent. The marine survival rate (OA3 recruits/release) forecast is a recent 3 year mean (2018-2020 smolt years).

Predictor Performance

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

Stock Forecasts and Status

The 2023 forecast for Quinault natural coho is 23,595 OA3 recruits, an increase from the 2022 forecast of 19,429.

The 2023 Quinault hatchery coho forecast is 30,566 OA3 recruits, a decrease from the 2022 forecast of 34,705.

3.2.4 Queets River

Predictor Description

The natural forecast was developed by multiplying the 2022 smolt outmigration of 135,678 by the predicted marine survival rate of 10.291 percent, which results in an abundance prediction of 13,963 JA3. The model uses run reconstructions developed by the Quinault Department of Fisheries (QDFi) as a response, which includes FRAM natural and incidental mortality, but does not include estimates of mark-selective fishery mortality. Expansion for mark-selective fishery mortality is estimated as mean (post season FRAM / QDFi run reconstruction for run years 2010 to 2020) * abundance prediction for 2023 = 1.095037 * 13,963 = 15,290.

Marine survival is typically predicted using a general additive logistic regression model (logit (recruits/smolt) ~ spline (explanatory variable(s))). The explanatory variables are the Pacific Decadal Oscillation index (PDO) maximum May-August and Biologically Effective Upwelling Transport Index (BEUTI) median April-August.

The hatchery forecast is based on the 2022 coho smolt release from the Salmon River Hatchery of 652,530 (565,993 adipose clipped). The OA3 marine survival rate of 2.2844 percent is estimated using the 3-year mean of marine survival over the years 2018-2020.

Predictor Performance

Forecast performance can be assessed, in part, by examining the differences between preseason forecasts and postseason estimates (Table III-3; Figure III-1a). In 2021, the OA3 preseason fall natural forecast was 78 percent of the postseason estimate.

Stock Forecasts and Status

The 2023 Queets natural coho forecast is 12,414 OA3 recruits, which is a decrease from the 2022 forecast of 18,160. This ocean abundance results in classification of this stock's status as "Abundant" under the 2019 PST Southern Coho Management Plan (Table III-5).

The 2023 Queets hatchery (Salmon River) coho forecast is 14,906 OA3 recruits, which is lower than the 2022 forecast of 18,035. Approximately 87 percent of the fish released from the Salmon River facility were marked with an adipose fin clip.

OFL

The OFL is defined in terms of spawner escapement (S_{OFL}). For Queets River coho, MFMT = 0.65, and the OFL is $S_{OFL} = 12,414 \times (1 - 0.65) = 4,345$. The preseason S_{OFL} value will be recalculated with postseason abundance estimates (when available) to assess OFL compliance.

3.2.5 Hoh River

Predictor Description

The natural coho forecast is based on estimated average smolt production per square mile of watershed from the Clearwater tributary which lies between the Queets River mainstem and the Hoh River. The Quinault Fisheries Department has a long-standing trapping program on the Clearwater River to estimate smolt production; it is assumed the two rivers produce smolts at a comparable rate per square mile of watershed. In 2022, the Clearwater produced 38,019 smolts at the rate of 272 smolts/mi². Applying that rate to the Hoh watershed of 299 mi² yields 81,328 natural coho smolts emigrating from the Hoh River in 2022.

A marine survival estimate to JA3 of 9.89 percent was applied to the total natural smolt production estimate to predict the 2023 return of Hoh River wild coho. This rate is the mean of two marine survival estimates of wild stocks that are to the north and south of the Hoh River: the Queets wild coho to the south with a marine survival estimate of 10.29 percent JA3 (Jurasin, QDFi) and Strait of Juan de Fuca wild coho to the north with a marine survival estimate of 9.48 percent JA3 (WDFW, 2023). The average marine survival rate of 9.89 percent JA3 (8.03 percent OA3) is within 2 percent of the OA3 survival of 6.6 percent predicted in the 2023 Wild Coho Forecasts for other Washington Coast coho stocks (WDFW, 2023).

No hatchery production is projected for the Hoh system for 2023.

Predictor Performance

Forecast performance can be assessed, in part, by examining the differences between preseason forecasts and postseason estimates (Table III-3; Figure III-1a). In 2021, the OA3 preseason natural forecast was 39 percent of the postseason estimate.

Stock Forecasts and Status

The 2023 Hoh River natural coho forecast is 6,531 OA3 recruits, an increase compared to the 2022 forecast of 4,679. This ocean abundance results in classification of this stock's status as "Abundant" under the 2019 PST Southern Coho Management Plan (Table III-5).

OFL

The OFL is defined in terms of spawner escapement (S_{OFL}). For Hoh River coho, MFMT = 0.65, and the OFL is $S_{OFL} = 6,531 \times (1 - 0.65) = 2,286$. The preseason S_{OFL} value will be recalculated with postseason abundance estimates (when available) to assess OFL compliance.

3.2.6 Quillayute River

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

Predictor Description

The natural coho forecast is based on coho smolt data measured in the Quillayute watershed in 2022 by West Fork Environmental and the Quileute Nation. A total of 339,000 coho smolts are estimated to have emigrated from the Quillayute River system in 2022.

Smolt abundance from the Dickey River was estimated to be 80,568 wild coho smolts (746 smolts/mi²). Smolt abundance from the Bogachiel, Calawah, and Sol Duc rivers was estimated to be 258,416 wild coho smolts (496 smolts/mi²).

Total smolts were separated into summer and fall natural coho smolts by the relative number of natural brood year 2020 spawners, 10.84 percent and 89.16 percent, respectively. Results from this separation yield estimates of 37,000 natural summer coho smolts and 302,000 natural fall coho smolts.

The JA3 natural marine survival estimate is 5.49 percent (4.46 percent OA3) for the Quillayute system natural coho. This is the past 10-year JA3 mean marine survival for Quillayute System wild stocks (JA3 recruits survival = $1.232 \times \text{OA3 recruits survival}$, this calculation of JA3 ocean survival was used beginning for 2016 coho forecast instead of the previous year's estimate methodology using OA3 recruitment to the fishery). This compares with a Quillayute marine survival of 6.6 percent OA3 (8.13 percent JA3) predicted by WDFW (WDFW 2023).

The hatchery coho forecast is calculated by applying a JA3 marine survival rate of 4.420 percent to the Sol Duc Hatchery coho released in 2022. An examination of the return rates of both hatchery releases and natural smolts indicate hatchery return rates are slightly below natural returns. A JA3 marine survival rate of 4.420 was derived by applying the last 10-year JA3 mean marine adult survival for Quillayute hatchery stocks.

Summer Coho

The summer natural coho forecast is based on the estimated total summer coho smolt production (36,754) and a JA3 projected marine survival rate of 5.491 percent.

The summer hatchery production forecast was based on a marine survival estimate of 4.420 percent multiplied by a release of 109,009 smolts from the Sol Duc Hatchery.

Fall Coho

The forecast for the natural component was based on the estimated total fall coho smolt production (302,230) multiplied by an expected marine survival rate of 5.491 percent, the same survival rate used to forecast summer natural returns.

The fall hatchery production forecast was based on a marine survival estimate of 4.42 percent multiplied by a release of 532,830 smolts.

Predictor Performance

Forecast performance can be assessed, in part, by examining the differences between preseason forecasts and postseason estimates (Table III-3; Figure III-1a). In 2021, the OA3 preseason fall natural forecast was 73 percent of the postseason estimate.

Stock Forecasts and Status

The 2023 Quillayute River summer natural and hatchery coho forecasts are 1,638 and 3,912 OA3 recruits, respectively; 99.2 percent of the hatchery smolts were marked with an adipose fin clip and coded wire tag. The 2023 forecast abundance of natural summer coho is higher than the 2022 forecast of 912.

The 2023 Quillayute River fall natural and hatchery coho forecasts are 13,475 and 19,121 OA3 recruits, respectively. The 2023 forecast abundance of Quillayute fall natural coho is higher than the 2022 forecast of 12,479. Approximately 85 percent of the hatchery fish were marked with an adipose fin clip.

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

3.2.7 North Washington Coast Independent Tributaries

Predictor Description

The 2023 forecast of natural coho production for these independent streams is based on a prediction of 483 smolts per square mile of watershed drainage, 424 square miles of watershed, and resulting in 205,000 (rounded from 204,792) smolts. This is multiplied by an expected marine survival rate of 6.6 percent.

The 2023 hatchery forecast is based on the predicted JA3 marine survival of 7.52 percent for the brood year 2020 multiplied by a proxy brood year smolt release (188,494 marked, 4,034 unmarked) into the Tsoo-Yess River from the Makah National Fish Hatchery. As a result of changing climate conditions and increasing difficulty with rearing coho in the hatchery over the summer, Makah National Fish Hatchery and the Makah Tribe implemented a coho fry release program. Smolt outmigration was estimated using a rotary screw trap.

Recently, new data became available to estimate hatchery origin adults separate from natural origin adults which rendered previous estimation methods based on the jack return rate insignificant. A single, best fit model was selected to predict marine survival of Tsoo-Yess coho entering the ocean 2022. The best-fit model uses the Pacific Decadal Oscillation (PDO) for the months of May through September as a predictor variable and predicted a JA3 marine survival rate of 7.52 percent.

Predictor Performance

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

Stock Forecasts and Status

The 2023 forecast of natural coho production for these independent streams is 13,530 OA3 recruits, compared to the 2022 preseason forecast of 18,020.

The 2023 hatchery forecast is 11,754 OA3 recruits (11,508 marked, 246 unmarked), compared to 133 in 2022. 97.9 percent of smolts released were marked with an adipose fin clip.

3.3 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 are currently 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 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 2020 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 2023 total Puget Sound region natural and hatchery coho ocean recruit forecast is 760,032, compared to a 2022 preseason forecast of 666,317. The 2023 natural forecast is 291,248, compared to the 2022 preseason forecast of 264,013. The 2023 hatchery forecast is 468,784, compared to the 2022 preseason forecast of 402,304.

A comparison was made of preseason OA3 forecasts with postseason estimates derived from run reconstructions using BKFRAM. This method expands observed escapements and actual catch to produce a FRAM estimate of post-season ocean abundance. This post-season FRAM estimate is dependent upon Base Period (1986-1992 fishing years) CWT recovery data. It should be noted that forecast methodology has changed over time, and the overall trends and biases may not reflect the current methods.

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

3.3.1 Strait of Juan de Fuca

Predictor Description

The natural forecast includes both Eastern and Western Strait of Juan de Fuca drainages. JA3 ocean recruits were predicted as the product of the estimated 2022 coho smolt outmigration from all independent tributaries of the Strait of Juan de Fuca, and a predicted marine survival rate (6.29 percent). The marine survival rate was predicted by a linear regression model using the NOAA copepod community index during the year of smolt outmigration. The linear relationship that this model solved for is highly significant ($P=0.0037$) and has an r^2 value of 0.34.

Predictor Performance

Forecast performance can be assessed, in part, by examining the differences between preseason forecasts and postseason estimates. In 2021, the preseason forecast was 30 percent of the postseason estimate (Table III-4).

Stock Forecasts and Status

The 2023 Strait of Juan de Fuca natural OA3 abundance forecast is 15,625 compared to the 2022 preseason forecast of 7,297.

The 2023 Strait of Juan de Fuca hatchery OA3 abundance forecast is 21,776, compared to the 2022 preseason forecast of 12,728.

The ocean abundance forecast for Strait of Juan de Fuca natural coho results in classification of the stock abundance as "Moderate" under the 2019 PST Southern Coho Management Plan and "Low" under the FMP. This results in an allowable total exploitation rate of no more than 40 percent under both the Council-adopted exploitation rate matrix (Appendix A, Table A-5) and the 2019 PST Southern Coho Management Plan (Table III-5).

OFL

The OFL is defined in terms of spawner escapement (S_{OFL}). For Strait of Juan de Fuca coho $MFMT = 0.60$, and the OFL is $S_{OFL} = 15,625 \times (1-0.60) = 6,250$. The preseason S_{OFL} value will be recalculated with postseason abundance estimates (when available) to assess OFL compliance.

3.3.2 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, ranging from 3.5 to 5.5 percent.

The hatchery forecast is based on recent 5-year median marine survival rate expectations for 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 2023 Nooksack-Samish natural OA3 abundance forecast is 29,504, compared to the 2022 preseason forecast of 36,046.

The 2023 Nooksack-Samish hatchery OA3 abundance forecast is 66,567, compared to the 2022 preseason forecast of 73,842.

3.3.3 Skagit

Predictor Description

This natural forecast is based on a prediction of total smolt to OA3 survival using a single beta regression model of PDO in May – September and SAR Chloro in May. The range of brood years used in this analysis was 2000 to 2018. The analysis produced a weighted average marine survival of 6.84 percent; this was multiplied by the measured smolt production from the Skagit basin (54,457 Baker natural smolts and 573,325 Skagit natural smolts).

The hatchery forecast is based on the weighted average of beta regression models of PDO_ May – September and SAR Chloro in May, and NPGO March – May and SAR Chloro in May. The analysis produced a weighted average marine survival of 3.73 percent; this was multiplied by the total number of 2022 smolts released from all regional hatcheries (11,964 Baker marked hatchery smolts, 44,173 Marblemount unmarked hatchery smolts, and 478,342 Marblemount marked hatchery smolts). This survival rate was also multiplied by the 2022 Oak Harbor net pen release of 29,950 to generate the Oak Harbor net pen forecast.

Predictor Performance

Forecast performance can be assessed, in part, by examining the differences between preseason forecasts and postseason estimates (Table III-4; Figure III-1b). In 2021, the preseason forecast was 52 percent of the postseason estimate.

Stock Forecasts and Status

The 2023 Skagit natural OA3 abundance forecast is 43,146, compared to the 2022 preseason forecast of 80,378.

The 2023 Skagit hatchery OA3 abundance forecast is 21,053, compared to the 2022 preseason forecast of 21,273.

The ocean abundance forecast for Skagit natural coho results in classification of the stock abundance as "Moderate" under the 2019 PST Southern Coho Management Plan and "Low" under the FMP. This results in an allowable total exploitation rate of no more than 35 percent under both the Council-adopted exploitation rate matrix (Appendix A, Table A-5) and the 2019 PST Southern Coho Management Plan (Table III-5).

OFL

The OFL is defined in terms of spawner escapement (S_{OFL}). For Skagit River coho, $MFMT = 0.60$ and the OFL is $S_{OFL} = 43,146 \times (1 - 0.60) = 17,258$. The preseason S_{OFL} value will be recalculated with postseason abundance estimates (when available) to assess OFL compliance.

3.3.4 Stillaguamish

Predictor Description

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

The natural coho marine survival rate is estimated at 5.7 percent, based on recent 5-year SF Skykomish marine survival estimates. Due to consecutive years of low returns, discussion with the co-managers concluded that a marine survival of 5.7 percent is most risk-averse for harvest management purposes.

The Stillaguamish Hatchery released 66,711 marked and 247 unmarked yearlings in 2022, with a forecasted adult return estimated at 1,738 marked and 6 unmarked based on current a hatchery marine survival estimate of 2.6 percent.

Predictor Performance

Forecast performance can be assessed, in part, by examining the differences between preseason forecasts and postseason estimates (Table III-4; Figure III-1b). In 2021, the preseason forecast was 63 percent of the postseason estimate.

Stock Forecasts and Status

The 2023 Stillaguamish natural OA3 abundance forecast is 30,238, compared to the 2022 preseason forecast of 24,892.

The 2023 Stillaguamish hatchery OA3 abundance is 1,744, compared to the 2022 preseason forecast of 1,937.

The ocean abundance forecast for Stillaguamish natural coho results in classification of the stock abundance as "Abundant" under the 2019 PST Southern Coho Management Plan and "Normal" under the FMP. This results in an allowable total exploitation rate of no more than 50 percent under both the Council-adopted exploitation rate matrix (Appendix A, Table A-5) and the 2019 PST Southern Coho Management Plan (Table III-5).

OFL

The OFL is defined in terms of spawner escapement (S_{OFL}). For Stillaguamish coho, $MFMT = 0.50$ and the OFL is $S_{OFL} = 30,238 \times (1 - 0.50) = 15,119$. The preseason S_{OFL} value will be recalculated with postseason abundance estimates (when available) to assess OFL compliance.

3.3.5 Snohomish

Predictor Description

The natural forecast is based on production of 2022 out-migrant smolts estimated from a mark-recapture estimate of smolt abundance from two smolt traps, one operated on the Skykomish River (river mile 26.5) and the second on the Snoqualmie River (river mile 12.2). The 2022 out-migrant smolt estimate for the Skykomish trap is based on the recent (four year) average percent production in the Snoqualmie relative to the Skykomish. Smolt trap estimates for the Skykomish and Snoqualmie rivers are summed and further expanded for rearing downstream of the trap locations in the Snohomish River. A marine survival rate of 5.4 percent, the average marine survival for brood year 2016-2017 Snohomish smolt coho, was applied to the total smolt production estimate for the Snohomish watershed of 1,417,000 smolts. The resulting forecast was rounded to the nearest hundred to account for co-manager agreed-to precision.

The hatchery forecast is based on 2022 hatchery releases of smolts from the WDFW Wallace River Hatchery, the Everett Net Pens, Eagle Creek, and Tulalip Bernie Kai Kai Gobin Hatchery and estimated marine survival rates for each release group. 2023 marine survival rates for Tulalip releases, 4.3 percent, were estimated from coded-wire tag recovery rates averaged for brood years 2018 and 2019. For Wallace, Eagle Creek, and Everett net pen releases, marine survival rates were based on Snohomish juvenile trap average survivals for brood years 2018-2019, 5.4 percent.

Predictor Performance

Forecast performance can be assessed, in part, by examining the differences between preseason forecasts and postseason estimates (Table III-4). In 2021, the preseason forecast was 55 percent of the postseason estimate.

Stock Forecasts and Status

The 2023 Snohomish natural OA3 abundance forecast is 76,500, compared to the 2022 preseason forecast of 64,200.

The 2023 Snohomish hatchery OA3 abundance forecast is 63,994, compared to the 2022 preseason forecast of 22,559.

The ocean abundance forecast for Snohomish natural coho results in classification of the stock abundance as "Moderate" under the 2019 PST Southern Coho Management Plan and "Low" under the FMP. This results in an allowable total exploitation rate of no more than 40 percent under both the Council-adopted exploitation rate matrix (Appendix A, Table A-5) and the 2019 PST Southern Coho Management Plan (Table III-5).

OFL

The OFL is defined in terms of spawner escapement (S_{OFL}). For Snohomish coho, $MFMT = 0.60$ and the OFL is $S_{OFL} = 76,500 \times (1 - 0.60) = 30,600$. The preseason S_{OFL} value will be recalculated with postseason abundance estimates (when available) to assess OFL compliance.

3.3.6 Hood Canal

Predictor Description

The natural forecast is based on a linear regression model that related the return of tagged natural jack coho at Big Beef Creek to Hood Canal December age-2 recruits in the subsequent run year, using brood years 1983-1998 and 2002-2018. This forecast was then converted to OA3. The 1999-2001 broods were excluded because of the unusually high recruit-per-tagged jack ratio, which is not expected to occur this year. For 2023, as was done since 2016, the co-managers agreed to apply a conservative bias correction for forecasting natural coho in Hood Canal.

The hatchery forecast is utilized an average marine survival from CWT-based cohort reconstruction of December age-2 recruits/smolt for the six most recent available broods from each facility, applied to the 2020 brood smolt releases for each facility and converted to OA3.

Predictor Performance

Forecast performance can be assessed, in part, by examining the differences between preseason forecasts and postseason estimates (Table III-4; Figure III-1b). In 2021, the preseason forecast was 63 percent of the postseason estimate.

Stock Forecasts and Status

The 2023 Hood Canal natural OA3 abundance forecast is 37,888, compared to the 2022 preseason forecast of 20,196.

The 2023 Hood Canal hatchery OA3 abundance forecast is 74,882, compared to the 2022 preseason forecast of 61,418.

The ocean abundance forecast for Hood Canal natural coho results in classification of the stock abundance as "Moderate" under the 2019 PST Southern Coho Management Plan and "Low" under the FMP. This results in an allowable total exploitation rate of no more than 45 percent under both the Council-adopted exploitation rate matrix (Appendix A, Table A-5) and the 2019 PST Southern Coho Management Plan (Table III-5).

OFL

The OFL is defined in terms of spawner escapement (S_{OFL}). For Hood Canal coho $MFMT = 0.65$, and the OFL is $S_{OFL} = 37,888 \times (1 - 0.65) = 13,261$. The preseason S_{OFL} value will be recalculated with postseason abundance estimates (when available) to assess OFL compliance.

3.3.7 South Sound

Predictor Description

The natural forecast is the product of projected smolt production from each of the stream basins in the region multiplied by a marine survival rate expectation for natural coho in the region. The upper South Sound natural stocks' marine survival rates ranged from 3.8 to 4.7 percent and were based on recent 5-year average marine survival. The deep South Sound stocks' marine survival predictions ranged from 3.8 to 8.1 percent and were derived using multiple methods. South Sound natural and Deschutes River natural forecasts were based modeling of PDO index May to September of ocean entry in the WDFW report '2023 Wild Coho Forecasts for Puget Sound, Washington Coast, and Lower Columbia' (WDFW 2023). The

Nisqually River natural forecast was based on a recent 5-year average marine survival. The Puyallup River natural forecast was based on recent 4-year average marine survival.

Stock Forecasts and Status

The 2023 South Sound natural OA3 abundance forecast is 58,347 compared to the 2022 preseason forecast of 31,004.

The 2023 South Sound hatchery OA3 abundance forecast is 218,828, compared to the 2022 preseason forecast of 208,547.

3.4. STOCK STATUS DETERMINATION UPDATES

Queets River natural coho, Strait of Juan de Fuca natural coho, and Snohomish River natural coho were found to meet the criteria for being classified as overfished in the PFMC *Review of 2017 Ocean Salmon Fisheries*, released in February 2018.

Queets River natural coho continue to meet the criteria for overfished status, Strait of Juan de Fuca natural coho have met the criteria for not overfished/rebuilding status, and Snohomish natural coho now meet the criteria for rebuilt status based on recent three-year geometric mean escapement estimates (2019-2021) detailed in the PFMC *Review of 2022 Ocean Salmon Fisheries* (PFMC 2023).

3.5. 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 Council area fisheries are generally similar to 2022 projections. Table III-6 summarizes projected 2023 mark rates for coho fisheries by month from Southern British Columbia, Canada to the Oregon Coast, based on preseason abundance forecasts.

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

| Year or Average | Preseason | Postseason ^{a/} | Pre/Post season ^{a/} | Preseason | Postseason ^{a/} | Pre/Post season ^{a/} | Preseason | Postseason ^{a/} | Pre/Post season ^{a/} | Preseason | Postseason ^{a/} | Pre/Post season ^{a/} |
|-------------------------|-----------|--------------------------|----------------------------------|-------------------------|--------------------------|----------------------------------|---------------------------------------|--------------------------|----------------------------------|--|--------------------------|----------------------------------|
| Columbia River Hatchery | | | | Columbia River Hatchery | | | Lower Columbia River Natural (LCN) | | | Oregon Coast Natural (OCN) (Rivers and Lakes) | | |
| Early | | | | Late | | | | | | | | |
| 1996-00 | 212.9 | 181.4 | 1.3 | 128.9 | 102.5 | 1.6 | | | | 62.7 | 52.8 | 1.5 |
| 2001 | 1036.5 | 873.0 | 1.2 | 491.8 | 488.3 | 1.0 | | | | 50.1 | 163.2 | 0.3 |
| 2002 | 161.6 | 324.7 | 0.5 | 143.5 | 271.8 | 0.5 | | | | 71.8 | 304.5 | 0.2 |
| 2003 | 440.0 | 645.7 | 0.7 | 377.9 | 248.0 | 1.5 | | | | 117.9 | 278.8 | 0.4 |
| 2004 | 313.6 | 389.0 | 0.8 | 274.7 | 203.0 | 1.4 | | | | 150.9 | 197.0 | 0.8 |
| 2005 | 284.6 | 282.7 | 1.0 | 78.0 | 111.6 | 0.7 | | | | 152.0 | 150.1 | 1.0 |
| 2006 | 245.8 | 251.4 | 1.0 | 113.8 | 156.3 | 0.7 | | | | 60.8 | 116.4 | 0.5 |
| 2007 | 424.9 | 291.0 | 1.5 | 139.5 | 171.0 | 0.8 | 21.5 | 20.5 | 1.0 | 255.4 | 60.0 | 4.3 |
| 2008 | 110.3 | 333.9 | 0.3 | 86.4 | 207.6 | 0.4 | 13.4 | 28.7 | 0.5 | 60.0 | 170.9 | 0.4 |
| 2009 | 672.7 | 681.4 | 1.0 | 369.7 | 374.1 | 1.0 | 32.7 | 37.6 | 0.9 | 211.6 | 257.0 | 0.8 |
| 2010 | 245.3 | 274.3 | 0.9 | 144.2 | 263.6 | 0.5 | 15.1 | 53.2 | 0.3 | 148.0 | 266.8 | 0.6 |
| 2011 | 216.0 | 288.5 | 0.7 | 146.5 | 141.2 | 1.0 | 22.7 | 29.5 | 0.8 | 249.4 | 311.6 | 0.8 |
| 2012 | 229.8 | 114.7 | 2.0 | 87.4 | 55.6 | 1.6 | 30.1 | 12.9 | 2.3 | 291.0 | 123.8 | 2.4 |
| 2013 | 331.6 | 190.8 | 1.7 | 169.5 | 110.7 | 1.5 | 46.5 | 36.8 | 1.3 | 191.0 | 128.4 | 1.5 |
| 2014 | 526.6 | 760.5 | 0.7 | 437.5 | 480.3 | 0.9 | 33.4 | 108.7 | 0.3 | 230.6 | 403.3 | 0.6 |
| 2015 | 515.2 | 150.5 | 3.4 | 261.9 | 91.8 | 2.9 | 35.9 | 20.9 | 1.7 | 206.6 | 70.4 | 2.9 |
| 2016 | 153.7 | 127.0 | 1.2 | 226.9 | 96.1 | 2.4 | 40.0 | 25.1 | 1.6 | 152.7 | 83.2 | 1.8 |
| 2017 | 231.7 | 170.9 | 1.4 | 154.6 | 108.4 | 1.4 | 30.1 | 31.2 | 1.0 | 101.9 | 65.6 | 1.6 |
| 2018 | 164.7 | 82.7 | 2.0 | 121.5 | 64.6 | 1.9 | 21.9 | 29.7 | 0.7 | 54.9 | 81.3 | 0.7 |
| 2019 | 545.0 | 191.4 | 2.8 | 360.6 | 106.1 | 3.4 | 36.9 | 34.1 | 1.1 | 76.1 | 107.6 | 0.7 |
| 2020 | 130.7 | 240.7 | 0.5 | 50.3 | 122.9 | 0.4 | 24.8 | 55.4 | 0.4 | 83.0 | 110.0 | 0.8 |
| 2021 | 1014.0 | 580.3 | 1.7 | 576.0 | 249.6 | 2.3 | 39.2 | 70.5 | 0.6 | 125.0 | 273.3 | 0.5 |
| 2022 | 592.5 | 434.3 | 1.4 | 404.7 | 250.9 | 1.6 | 65.7 | 73.1 | 0.9 | 222.4 | 191.5 | 1.2 |
| 2023 | 481.8 | - | - | 404.3 | - | - | 45.5 | - | - | 238.8 | - | - |

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

| Year or Average | Preseason | Postseason ^{a/} | Pre/Post season ^{a/} | Preseason | Postseason ^{a/} | Pre/Post season ^{a/} | Preseason | Postseason ^{a/} | Pre/Post season ^{a/} | Preseason | Postseason ^{a/} | Pre/Post season ^{a/} |
|--------------------|--|--------------------------|----------------------------------|--------------------------------------|--------------------------|----------------------------------|---|--------------------------|----------------------------------|--|--------------------------|----------------------------------|
| | Salmon Trout Enhancement Program (STEP) ^{c/} | | | Oregon Coast North of Cape Blanco | | | California and Oregon Coast South of Cape Blanco | | | Oregon Production Index (OPI) Area Hatchery Total ^{b/} | | |
| 1996-00 | 0.6 | | | | | | | | | | | |
| 2001 | 1.0 | 1.4 | 0.7 | 127.3 | 46.9 | 2.7 | 52.0 | 46.0 | 1.1 | 1,707.6 | 1,454.2 | 1.2 |
| 2002 | 0.6 | 3.0 | 0.2 | 36.6 | 41.6 | 0.9 | 20.0 | 22.0 | 0.9 | 361.7 | 660.1 | 0.5 |
| 2003 | 3.6 | 3.6 | 1.0 | 29.3 | 34.5 | 0.8 | 15.9 | 24.3 | 0.7 | 863.1 | 952.5 | 0.9 |
| 2004 | 3.1 | 1.0 | 3.1 | 16.6 | 21.7 | 0.8 | 19.0 | 29.9 | 0.6 | 623.9 | 634.6 | 1.0 |
| 2005 | 1.0 | 0.4 | 2.5 | 11.5 | 10.7 | 1.1 | 15.8 | 38.1 | 0.4 | 389.9 | 443.1 | 0.9 |
| 2006 | 0.6 | 0.1 | 6.0 | 8.6 | 7.9 | 1.1 | 30.6 | 25.0 | 1.2 | 398.8 | 440.6 | 0.9 |
| 2007 | 0.2 | 0.0 | - | 7.0 | 1.3 | 5.4 | 22.2 | 13.2 | 1.7 | 593.6 | 476.5 | 1.2 |
| 2008 | | | | 1.7 | 7.1 | 0.2 | 17.7 | 16.8 | 1.1 | 216.1 | 565.4 | 0.4 |
| 2009 | | | | 7.3 | 7.5 | 1.0 | 23.4 | 3.1 | 7.5 | 1,073.1 | 1,066.2 | 1.0 |
| 2010 | | | | 4.4 | 8.6 | 0.5 | 14.1 | 4.8 | 2.9 | 408.0 | 551.3 | 0.7 |
| 2011 | | | | 3.6 | 3.6 | 1.0 | 9.0 | 9.0 | 1.0 | 375.1 | 442.3 | 0.8 |
| 2012 | | | | 6.4 | 3.1 | 2.1 | 18.1 | 8.6 | 2.1 | 341.7 | 182.3 | 1.9 |
| 2013 | | | | 5.6 | 5.7 | 1.0 | 18.7 | 7.6 | 2.5 | 525.4 | 316.9 | 1.7 |
| 2014 | | | | 4.8 | 19.3 | 0.2 | 14.2 | 3.4 | 4.2 | 983.1 | 1,263.6 | 0.8 |
| 2015 | | | | 6.9 | 5.6 | 1.2 | 24.4 | 3.8 | 6.4 | 808.4 | 251.7 | 3.2 |
| 2016 | | | | 5.5 | 9.3 | 0.6 | 10.4 | 1.5 | 6.9 | 396.5 | 233.8 | 1.7 |
| 2017 | | | | 3.5 | 1.9 | 1.8 | 4.5 | 3.6 | 1.3 | 394.3 | 284.8 | 1.4 |
| 2018 | | | | 3.3 | 1.1 | 3.0 | 4.6 | 1.0 | 4.6 | 294.1 | 149.4 | 2.0 |
| 2019 | | | | 12.0 | 2.2 | 5.5 | 15.9 | 0.8 | 19.9 | 933.5 | 300.5 | 3.1 |
| 2020 | | | | 2.4 | 4.7 | 0.5 | 2.3 | 1.3 | 1.8 | 185.7 | 369.6 | 0.5 |
| 2021 | | | | 6.4 | 5.8 | 1.1 | 11.5 | 5.6 | 2.1 | 1,607.9 | 841.3 | 1.9 |
| 2022 | | | | 1.9 | 5.5 | 0.3 | 4.4 | 5.2 | 0.8 | 1,003.5 | 696.0 | 1.4 |
| 2023 | | | | 3.0 | - | - | 7.8 | - | - | 896.9 | - | - |

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

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

c/ Program was discontinued in 2005.

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

| Year or Avg. | Ocean Fisheries ^{b/} | | Hatcheries and Freshwater | | | Columbia River | | Ocean Exploitation Rate Based on OPI Abundance ^{f/} |
|--------------------|-------------------------------|-------|------------------------------|-----------------------------|--------------------|----------------|-------------------------|--|
| | Troll | Sport | Harvest ^{c/} | OCN Spaw ners ^{d/} | Private Hatcheries | Returns | Abundance ^{e/} | |
| 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 | 0.84 |
| 1981-1985 | 451.2 | 274.0 | 37.2 | 56.0 | 176.8 | 305.3 | 1,328.6 | 0.55 |
| 1986-1990 | 574.6 | 339.3 | 55.1 | 45.5 | 154.3 | 705.0 | 1,602.2 | 0.57 |
| 1991-1995 | 107.4 | 182.7 | 46.6 | 53.2 | 35.1 | 315.1 | 668.4 | 0.43 |
| 1996 | 7.0 | 31.8 | 45.8 | 87.5 | - | 117.1 | 260.3 | 0.15 |
| 1997 | 5.5 | 22.4 | 27.9 | 31.6 | - | 156.4 | 230.5 | 0.12 |
| 1998 | 3.5 | 12.8 | 31.2 | 34.9 | - | 175.9 | 270.8 | 0.06 |
| 1999 | 3.6 | 36.5 | 23.4 | 48.6 | - | 289.1 | 432.0 | 0.09 |
| 2000 | 25.2 | 74.6 | 37.0 | 84.8 | - | 558.3 | 762.4 | 0.13 |
| 2001 | 38.1 | 216.8 | 75.7 | 174.7 | - | 1128.3 | 1,673.2 | 0.15 |
| 2002 | 15.0 | 118.7 | 53.9 | 266.9 | - | 535.8 | 972.2 | 0.14 |
| 2003 | 28.8 | 252.4 | 44.9 | 236.2 | - | 713.2 | 1,266.9 | 0.22 |
| 2004 | 26.2 | 159.3 | 38.1 | 198.5 | - | 463.5 | 904.5 | 0.21 |
| 2005 | 10.5 | 58.2 | 42.7 | 165.1 | - | 354.7 | 629.9 | 0.11 |
| 2006 | 4.5 | 47.5 | 29.5 | 133.1 | - | 409.7 | 674.1 | 0.08 |
| 2007 | 26.2 | 128.5 | 10.9 | 71.6 | - | 349.0 | 631.3 | 0.25 |
| 2008 | 0.6 | 26.4 | 16.0 | 180.2 | - | 520.8 | 769.8 | 0.04 |
| 2009 | 27.7 | 201.2 | 16.5 | 265.5 | - | 760.2 | 1,341.3 | 0.17 |
| 2010 | 5.8 | 48.8 | 18.5 | 287.7 | - | 466.5 | 848.4 | 0.06 |
| 2011 | 4.2 | 54.7 | 20.0 | 361.3 | - | 378.1 | 836.4 | 0.07 |
| 2012 | 4.7 | 45.5 | 18.5 | 104.9 | - | 152.4 | 311.3 | 0.16 |
| 2013 | 8.4 | 48.3 | 26.5 | 136.8 | - | 252.8 | 494.1 | 0.11 |
| 2014 | 35.6 | 197.4 | 42.0 | 362.4 | - | 1,019.5 | 1,724.8 | 0.14 |
| 2015 | 11.7 | 84.4 | 11.8 | 61.6 | - | 169.5 | 350.5 | 0.27 |
| 2016 | 2.8 | 31.7 | 11.4 | 83.5 | - | 203.6 | 340.3 | 0.10 |
| 2017 | 2.1 | 50.0 | 3.9 | 66.2 | - | 235.9 | 362.4 | 0.14 |
| 2018 | 1.5 | 53.8 | 3.1 | 83.8 | - | 137.2 | 265.8 | 0.21 |
| 2019 | 5.0 | 135.4 | 4.3 | 97.8 | - | 212.4 | 454.3 | 0.31 |
| 2020 | 2.3 | 40.2 | 8.1 | 111.8 | - | 338.6 | 499.7 | 0.08 |
| 2021 | 5.0 | 158.6 | 21.1 | 251.1 | - | 665.7 | 1,126.9 | 0.15 |
| 2022 ^{g/} | 8.4 | 127.4 | 15.8 | 169.8 | - | 524.5 | 896.8 | 0.15 |

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

b/ Includes estimated non-retention mortalities; troll: release mort.(1982-present) and drop-off mort.(all yrs.); sport: release mort.(1994-present) and drop-off mort.(all yrs.).

c/ Includes STEP smolt releases through the 2007 return year, after which the program was terminated.

d/ Includes Rogue River.

e/ FRAM post-season runs used after 1985 and includes OPI origin stock catches in all fisheries.

f/ Private hatchery stocks are excluded in calculating the OPI area stock aggregate ocean exploitation rate index.

g/ Preliminary.

TABLE III-3. Preseason forecasts and postseason estimates of ocean abundance for selected Washington coastal adult natural coho stocks in thousands of fish. (Page 1 of 2)

| Year or Ave. | 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 | | |
| 1991-1995 | 15.4 | 16.2 | 1.07 | 7.1 | 8.5 | 1.32 | 11.9 | 14.0 | 1.2 |
| 1996 | 13.0 | 20.3 | 0.64 | 4.2 | 7.7 | 0.54 | 8.3 | 22.6 | 0.37 |
| 1997 | 8.9 | 5.8 | 1.53 | 2.8 | 4.1 | 0.68 | 4.3 | 2.2 | 1.92 |
| 1998 | 8.0 | 17.4 | 0.46 | 3.4 | 5.6 | 0.61 | 4.2 | 6.3 | 0.66 |
| 1999 | 14.5 | 16.1 | 0.90 | 3.2 | 6.8 | 0.47 | 4.3 | 8.6 | 0.50 |
| 2000 | 8.7 | 16.5 | 0.53 | 3.5 | 9.3 | 0.38 | 2.7 | 12.1 | 0.22 |
| 2001 | 23.0 | 28.4 | 0.81 | 8.5 | 16.2 | 0.52 | 12.0 | 35.8 | 0.33 |
| 2002 | 22.3 | 33.2 | 0.67 | 8.5 | 13.2 | 0.64 | 12.5 | 26.3 | 0.47 |
| 2003 | 24.9 | 22.5 | 1.11 | 12.5 | 8.7 | 1.44 | 24.0 | 15.7 | 1.52 |
| 2004 | 21.2 | 20.7 | 1.02 | 8.1 | 6.9 | 1.17 | 18.5 | 13.3 | 1.39 |
| 2005 | 18.6 | 20.9 | 0.89 | 7.6 | 8.2 | 0.93 | 17.1 | 11.9 | 1.43 |
| 2006 | 14.6 | 9.9 | 1.48 | 6.4 | 2.7 | 2.36 | 8.3 | 9.2 | 0.90 |
| 2007 | 10.8 | 10.7 | 1.01 | 5.4 | 5.8 | 0.93 | 13.6 | 7.1 | 1.92 |
| 2008 | 10.5 | 11.1 | 0.95 | 4.3 | 4.3 | 1.00 | 10.2 | 7.4 | 1.39 |
| 2009 | 19.3 | 15.5 | 1.24 | 9.5 | 9.5 | 1.00 | 31.4 | 16.0 | 1.97 |
| 2010 | 22.0 | 17.1 | 1.29 | 7.6 | 11.4 | 0.67 | 21.8 | 19.9 | 1.09 |
| 2011 | 28.2 | 13.3 | 2.11 | 11.6 | 13.0 | 0.89 | 13.3 | 15.1 | 0.88 |
| 2012 | 33.5 | 12.8 | 2.61 | 14.3 | 8.1 | 1.77 | 37.2 | 9.1 | 4.08 |
| 2013 | 17.2 | 15.8 | 1.09 | 8.6 | 9.2 | 0.94 | 24.5 | 9.9 | 2.48 |
| 2014 | 18.4 | 17.3 | 1.07 | 8.9 | 9.1 | 0.97 | 10.3 | 12.8 | 0.80 |
| 2015 | 10.5 | 4.8 | 2.19 | 5.1 | 2.9 | 1.74 | 7.5 | 2.7 | 2.75 |
| 2016 | 4.5 | 11.7 | 0.38 | 2.1 | 5.4 | 0.39 | 3.5 | 6.5 | 0.54 |
| 2017 | 15.8 | 12.9 | 1.22 | 6.2 | 6.0 | 1.03 | 6.5 | 6.8 | 0.96 |
| 2018 | 10.6 | 8.7 | 1.22 | 5.8 | 3.7 | 1.56 | 7.0 | 3.4 | 2.04 |
| 2019 | 14.8 | 10.9 | 1.36 | 7.0 | 5.2 | 1.36 | 11.2 | 3.9 | 2.84 |
| 2020 | 9.2 | 9.1 | 1.01 | 4.2 | 5.4 | 0.77 | 7.8 | 5.1 | 1.53 |
| 2021 | 7.5 | 10.4 | 0.73 | 3.0 | 7.8 | 0.39 | 3.9 | 5.0 | 0.78 |
| 2022 | 12.5 | - | - | 4.7 | - | - | 18.2 | - | - |
| 2023 | 13.5 | - | - | 6.5 | - | - | 12.4 | - | - |

TABLE III-3. Preseason forecasts and postseason estimates of age-3 ocean abundance for selected Washington coastal adult natural coho stocks in thousands of fish. ^{a/} (Page 2 of 2)

| Year or Ave. | Preseason Forecast | Postseason Return | Pre/Post- season | Preseason Forecast | Postseason Return | Pre/Post- season |
|-----------------|-----------------------|----------------------|---------------------|----------------------------------|----------------------|---------------------|
| | Grays Harbor | | | Willapa Bay | | |
| 1991-1995 | 122.8 | 68.0 | 2.2 | Data not available until 2010 | | |
| 1996 | 121.4 | 89.7 | 1.4 | | | |
| 1997 | 26.1 | 20.2 | 1.3 | | | |
| 1998 | 30.1 | 46.4 | 0.6 | | | |
| 1999 | 57.7 | 42.7 | 1.4 | | | |
| 2000 | 47.8 | 51.9 | 0.9 | | | |
| 2001 | 51.3 | 103.2 | 0.5 | | | |
| 2002 | 55.4 | 142.0 | 0.4 | | | |
| 2003 | 58.0 | 108.4 | 0.5 | | | |
| 2004 | 117.9 | 90.8 | 1.3 | | | |
| 2005 | 91.1 | 65.9 | 1.4 | | | |
| 2006 | 67.3 | 30.6 | 2.2 | | | |
| 2007 | 59.4 | 34.6 | 1.7 | | | |
| 2008 | 42.7 | 49.0 | 0.9 | | | |
| 2009 | 59.2 | 104.6 | 0.6 | | | |
| 2010 | 67.9 | 117.4 | 0.6 | 20.4 | 101.1 | 0.20 |
| 2011 | 89.1 | 86.2 | 1.0 | 47.8 | 61.6 | 0.78 |
| 2012 | 150.2 | 103.9 | 1.4 | 81.3 | 40.6 | 2.00 |
| 2013 | 196.8 | 80.3 | 2.4 | 58.6 | 36.7 | 1.60 |
| 2014 | 108.8 | 152.9 | 0.7 | 58.9 | 95.6 | 0.62 |
| 2015 | 142.6 | 31.7 | 4.5 | 42.9 | 18.6 | 2.30 |
| 2016 | 35.7 | 35.3 | 1.0 | 39.5 | 40.5 | 0.98 |
| 2017 | 50.0 | 37.3 | 1.3 | 36.7 | 14.3 | 2.56 |
| 2018 | 42.5 | 60.8 | 0.7 | 20.7 | 17.0 | 1.21 |
| 2019 | 71.8 | 51.0 | 1.4 | 63.4 | 19.4 | 3.27 |
| 2020 | 50.0 | 31.6 | 1.6 | 17.9 | 18.5 | 0.96 |
| 2021 | 44.8 | 77.4 | 0.6 | 19.0 | 29.8 | 0.64 |
| 2022 | 120.4 | - | - | 35.8 | - | - |
| 2023 | 102.8 | - | - | 42.7 | - | - |

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

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

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

| Year or Ave. | Preseason Forecast ^{b/} | Postseason Return | Pre/Postseason | Preseason Forecast | Postseason Return | Pre/Postseason | Preseason Forecast | Postseason Return | Pre/Postseason |
|---------------------|-------------------------------------|----------------------|----------------|----------------------------|----------------------|----------------|-----------------------|----------------------|----------------|
| Skagit River | | | | Stillaguamish River | | | | Hood Canal | |
| 1991-1995 | NA | 82.0 | - | 53.6 | 18.1 | 3.74 | 94.2 | 14.2 | 6.63 |
| 1996 | NA | 48.3 | - | 51.6 | 12.5 | 4.13 | 25.1 | 37.2 | 0.67 |
| 1997 | 70.9 | 63.1 | 1.12 | 36.0 | 14.1 | 2.56 | 78.4 | 101.8 | 0.77 |
| 1998 | 55.0 | 95.1 | 0.58 | 47.8 | 31.1 | 1.54 | 108.0 | 118.5 | 0.91 |
| 1999 | 75.7 | 40.9 | 1.85 | 35.7 | 7.5 | 4.77 | 65.1 | 17.6 | 3.70 |
| 2000 | 30.2 | 95.2 | 0.32 | 17.7 | 31.2 | 0.57 | 61.0 | 39.7 | 1.54 |
| 2001 | 87.2 | 132.5 | 0.66 | 24.4 | 81.8 | 0.30 | 62.0 | 110.0 | 0.56 |
| 2002 | 98.5 | 71.8 | 1.37 | 19.7 | 30.4 | 0.65 | 34.9 | 81.0 | 0.43 |
| 2003 | 116.6 | 114.1 | 1.02 | 37.8 | 49.8 | 0.76 | 33.4 | 199.9 | 0.17 |
| 2004 | 155.8 | 145.3 | 1.07 | 38.0 | 73.9 | 0.51 | 98.7 | 219.7 | 0.45 |
| 2005 | 61.8 | 52.4 | 1.18 | 56.7 | 29.1 | 1.95 | 98.4 | 68.3 | 1.44 |
| 2006 | 106.6 | 11.5 | 9.25 | 45.0 | 11.8 | 3.81 | 59.4 | 49.7 | 1.20 |
| 2007 | 26.8 | 83.0 | 0.32 | 69.2 | 45.2 | 1.53 | 42.4 | 78.6 | 0.54 |
| 2008 | 61.4 | 35.5 | 1.73 | 31.0 | 15.3 | 2.03 | 30.4 | 25.8 | 1.18 |
| 2009 | 33.4 | 87.5 | 0.38 | 13.4 | 27.4 | 0.49 | 48.6 | 45.7 | 1.06 |
| 2010 | 95.9 | 64.6 | 1.48 | 25.9 | 16.8 | 1.55 | 33.2 | 14.5 | 2.29 |
| 2011 | 138.1 | 78.1 | 1.77 | 66.6 | 61.3 | 1.09 | 74.7 | 56.8 | 1.31 |
| 2012 | 48.3 | 139.1 | 0.35 | 47.5 | 60.6 | 0.78 | 73.4 | 125.5 | 0.58 |
| 2013 | 137.2 | 150.7 | 0.91 | 33.1 | 78.1 | 0.42 | 36.8 | 37.9 | 0.97 |
| 2014 | 112.4 | 51.7 | 2.17 | 32.5 | 49.1 | 0.66 | 82.8 | 69.6 | 1.19 |
| 2015 | 121.4 | 15.5 | 7.82 | 31.3 | 5.6 | 5.59 | 61.5 | 63.7 | 0.96 |
| 2016 | 8.9 | 44.7 | 0.20 | 2.8 | 15.6 | 0.18 | 35.3 | 31.8 | 1.11 |
| 2017 | 11.2 | 22.3 | 0.50 | 7.6 | 6.9 | 1.10 | 115.6 | 35.0 | 3.31 |
| 2018 | 59.4 | 36.9 | 1.61 | 19.0 | 30.9 | 0.62 | 59.9 | 18.7 | 3.20 |
| 2019 | 58.2 | 27.5 | 2.12 | 23.9 | 16.2 | 1.48 | 40.4 | 14.7 | 2.76 |
| 2020 | 31.0 | 41.5 | 0.75 | 19.5 | 24.7 | 0.79 | 35.0 | 23.6 | 1.48 |
| 2021 | 58.4 | 112.0 | 0.52 | 26.8 | 42.7 | 0.63 | 28.8 | 45.7 | 0.63 |
| 2022 | 80.4 | - | - | 24.9 | - | - | 20.2 | - | - |
| 2023 | 43.1 | - | - | 30.2 | - | - | 37.9 | - | - |

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

| Year or Ave. | Preseason Forecast | Postseason Return | Pre/Postseason | Preseason Forecast | Postseason Return | Pre/Postseason |
|-----------------|-----------------------|----------------------|------------------------|-----------------------|----------------------|----------------|
| Snohomish | | | Strait of Juan de Fuca | | | |
| 1991-1995 | 341.6 | 200.6 | 1.85 | 20.6 | 19.3 | 1.22 |
| 1996 | 338.1 | 132.3 | 2.55 | 10.7 | 19.4 | 0.55 |
| 1997 | 186.6 | 106.4 | 1.75 | 6.5 | 20.3 | 0.32 |
| 1998 | 165.3 | 193.9 | 0.85 | 16.8 | 21.0 | 0.80 |
| 1999 | 141.6 | 82.2 | 1.72 | 14.7 | 9.9 | 1.48 |
| 2000 | 53.0 | 154.6 | 0.34 | 13.5 | 28.6 | 0.47 |
| 2001 | 129.6 | 360.1 | 0.36 | 21.4 | 43.9 | 0.49 |
| 2002 | 123.1 | 185.5 | 0.66 | 21.3 | 26.3 | 0.81 |
| 2003 | 203.0 | 198.0 | 1.03 | 25.6 | 22.9 | 1.12 |
| 2004 | 192.1 | 287.9 | 0.67 | 35.7 | 23.8 | 1.50 |
| 2005 | 241.6 | 133.4 | 1.81 | 20.7 | 12.5 | 1.66 |
| 2006 | 139.5 | 94.2 | 1.48 | 26.1 | 4.6 | 5.65 |
| 2007 | 98.9 | 156.4 | 0.63 | 29.9 | 10.2 | 2.92 |
| 2008 | 92.0 | 49.5 | 1.86 | 24.1 | 3.9 | 6.25 |
| 2009 | 67.0 | 133.4 | 0.50 | 20.5 | 24.7 | 0.83 |
| 2010 | 99.4 | 54.4 | 1.83 | 8.5 | 20.1 | 0.42 |
| 2011 | 180.0 | 137.4 | 1.31 | 12.3 | 11.7 | 1.05 |
| 2012 | 109.0 | 175.8 | 0.62 | 12.6 | 12.5 | 1.01 |
| 2013 | 163.8 | 176.0 | 0.93 | 12.6 | 9.8 | 1.29 |
| 2014 | 150.0 | 66.6 | 2.25 | 12.5 | 13.8 | 0.91 |
| 2015 | 151.5 | 28.3 | 5.35 | 11.1 | 4.7 | 2.36 |
| 2016 | 20.6 | 54.1 | 0.38 | 4.4 | 8.7 | 0.51 |
| 2017 | 107.3 | 23.2 | 4.63 | 13.1 | 5.9 | 2.24 |
| 2018 | 66.3 | 77.6 | 0.85 | 7.2 | 5.9 | 1.21 |
| 2019 | 62.9 | 48.7 | 1.29 | 8.8 | 5.3 | 1.68 |
| 2020 | 39.0 | 47.7 | 0.82 | 7.5 | 9.2 | 0.82 |
| 2021 | 60.0 | 109.9 | 0.55 | 6.7 | 22.5 | 0.30 |
| 2022 | 64.2 | - | - | 7.3 | - | - |
| 2023 | 76.5 | - | - | 15.6 | - | - |

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

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

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

| FMP | | |
|------------------------|--|----------------------------------|
| FMP Stock | Total Exploitation Rate Constraint ^{a/} | Categorical Status ^{a/} |
| Skagit | 35% | Low |
| Stillaguamish | 50% | Normal |
| Snohomish | 40% | Low |
| Hood Canal | 45% | Low |
| Strait of Juan de Fuca | 40% | Low |
| Quillayute Fall | 59% | |
| Hoh | 65% | |
| Queets | 65% | |
| Grays Harbor | 65% | |

| PST Southern Coho Management Plan | | |
|--|--|----------------------------------|
| U.S. Management Unit | Total Exploitation Rate Constraint ^{b/} | Categorical Status ^{c/} |
| Skagit | 35% | Moderate |
| Stillaguamish | 50% | Abundant |
| Snohomish | 40% | Moderate |
| Hood Canal | 45% | Moderate |
| Strait of Juan de Fuca | 40% | Moderate |
| Quillayute Fall ^{c/} | 53% | Abundant |
| Hoh ^{c/} | 69% | Abundant |
| Queets ^{c/} | 53% | Abundant |
| Grays Harbor ^{c/d/} | 69% | Abundant |

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

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

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

d/ Based on projected natural area spawners (wild plus hatchery strays) and MSP escapement goal of 35,400. Exploitation rate constraint subject to change should comanagers agree to a modified escapement goal under U.S. v. Washington and Hoh v. Baldrige case law.

TABLE III-6. Projected coho mark rates for 2023 U.S. forecasts under base period fishing patterns (percent marked).

| Area | Fishery | June | July | August | Sept |
|----------------------------------|--------------|------|------|--------|------|
| Canada | | | | | |
| Johnstone Strait | Recreational | -- | 26% | 23% | -- |
| West Coast Vancouver Island | Recreational | 45% | 35% | 30% | 29% |
| North Georgia Strait | Recreational | 38% | 39% | 38% | 33% |
| South Georgia Strait | Recreational | 40% | 45% | 42% | 41% |
| Juan de Fuca Strait | Recreational | 44% | 43% | 45% | 40% |
| Johnstone Strait | Troll | 46% | 35% | 28% | 31% |
| NW Vancouver Island | Troll | 43% | 38% | 40% | 40% |
| SW Vancouver Island | Troll | 54% | 46% | 48% | 48% |
| Georgia Strait | Troll | 47% | 43% | 44% | 38% |
| Puget Sound | | | | | |
| Strait of Juan de Fuca (Area 5) | Recreational | 61% | 48% | 48% | 46% |
| Strait of Juan de Fuca (Area 6) | Recreational | 53% | 46% | 48% | 43% |
| San Juan Island (Area 7) | Recreational | 47% | 52% | 43% | 31% |
| North Puget Sound (Areas 6 & 7A) | Net | -- | 51% | 49% | 32% |
| Council Area | | | | | |
| Neah Bay (Area 4/4B) | Recreational | 45% | 57% | 51% | 60% |
| LaPush (Area 3) | Recreational | 58% | 60% | 67% | 49% |
| Westport (Area 2) | Recreational | 74% | 71% | 68% | 63% |
| Columbia River (Area 1) | Recreational | 77% | 79% | 70% | 73% |
| Tillamook | Recreational | 68% | 62% | 55% | 46% |
| Newport | Recreational | 61% | 55% | 53% | 40% |
| Coos Bay | Recreational | 50% | 45% | 35% | 22% |
| Brookings | Recreational | 44% | 30% | 26% | 6% |
| Neah Bay (Area 4/4B) | Troll | 54% | 52% | 54% | 58% |
| LaPush (Area 3) | Troll | 53% | 55% | 53% | 53% |
| Westport (Area 2) | Troll | 59% | 64% | 66% | 64% |
| Columbia River (Area 1) | Troll | 75% | 75% | 71% | 57% |
| Tillamook | Troll | 63% | 61% | 59% | 57% |
| Newport | Troll | 59% | 56% | 51% | 50% |
| Coos Bay | Troll | 49% | 45% | 40% | 25% |
| Brookings | Troll | 37% | 36% | 41% | 60% |
| Columbia River | | | | | |
| Buoy 10 | Recreational | -- | -- | -- | 65% |

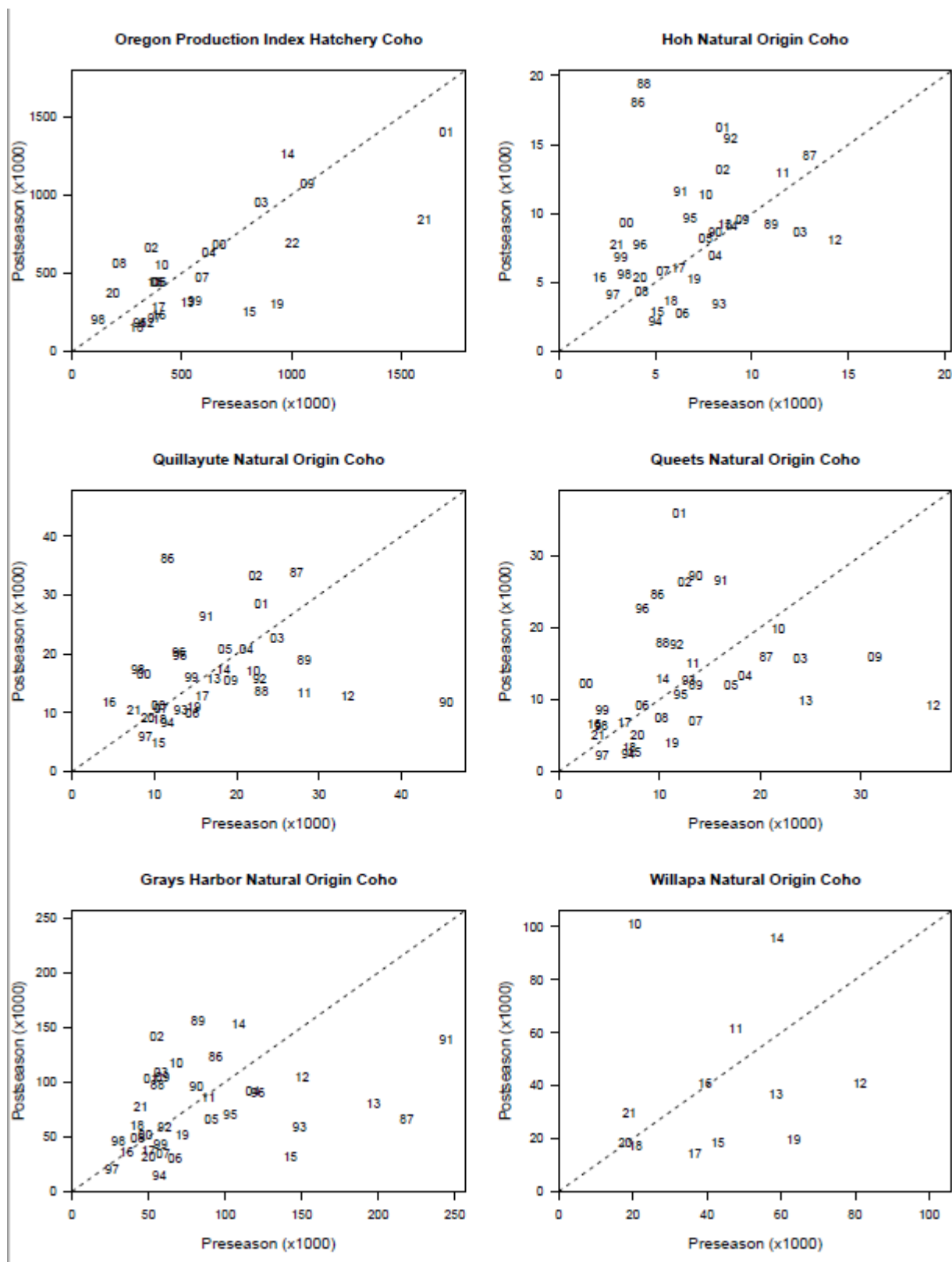


FIGURE III-1a. Selected preseason vs. postseason forecasts for coho stocks with substantial contribution to Council area fisheries.

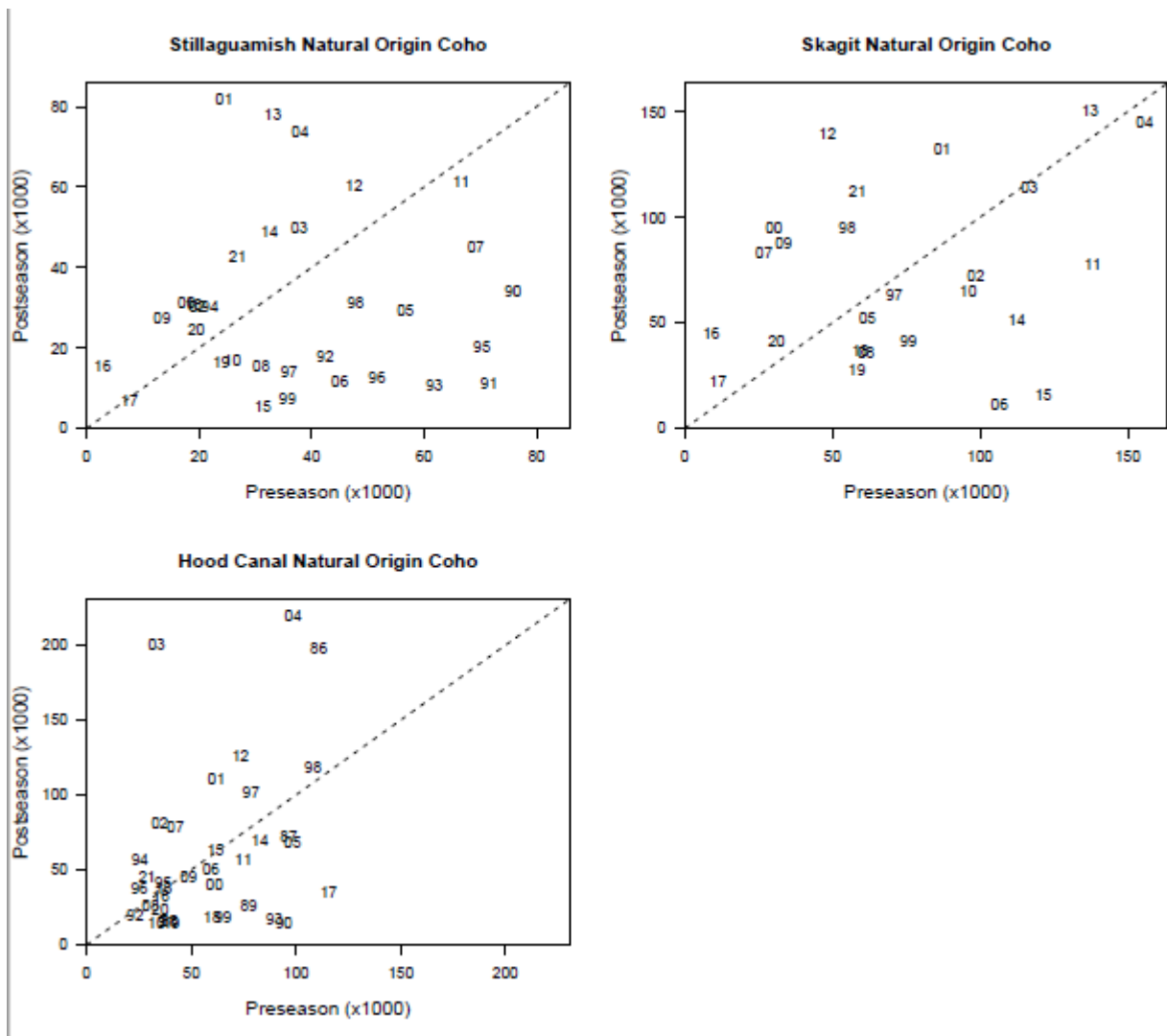


FIGURE III-1b. Selected preseason vs. postseason forecasts for coho stocks with substantial contribution to Council area fisheries.

CHAPTER IV: AFFECTED ENVIRONMENT - PINK SALMON ASSESSMENT

Two major runs comprise the pink salmon population available to Council fisheries during odd-numbered years: the Puget Sound run, and the Fraser River (British Columbia) run, the latter is the more abundant of the two. The 2021 pink salmon run size forecasts were 2,925,681 for the Puget Sound and 3,009,000 for the Fraser River. The actual 2021 run size was 8,105,000 in the Fraser River and 3,771,032 in Puget Sound.

The 2023 pink salmon run size forecasts are 3,950,917 for the Puget Sound and 6,140,000 for the Fraser River. See Table IV-1 for details.

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

| Year | Puget Sound | | Fraser River ^{a/} | |
|--------------------|-------------|--------|----------------------------|--------|
| | Forecast | Actual | Forecast | Actual |
| 1977 | NA | 0.88 | NA | 8.21 |
| 1979 | NA | 1.32 | NA | 14.40 |
| 1981 | NA | 0.50 | NA | 18.69 |
| 1983 | NA | 1.01 | NA | 15.35 |
| 1985 | NA | 1.76 | NA | 19.10 |
| 1987 | NA | 1.57 | NA | 7.17 |
| 1989 | NA | 1.93 | NA | 16.63 |
| 1991 | NA | 1.09 | NA | 22.18 |
| 1993 | NA | 1.06 | NA | 16.98 |
| 1995 | 3.4 | 2.08 | NA | 12.90 |
| 1997 | NA | 0.44 | 11.40 | 8.18 |
| 1999 | NA | 0.96 | NA | 3.59 |
| 2001 | 2.92 | 3.56 | 5.47 | 21.17 |
| 2003 | 2.32 | 2.90 | 17.30 | 26.00 |
| 2005 | 1.98 | 1.23 | 16.30 | 10.00 |
| 2007 | 3.34 | 2.45 | 19.60 | 11.00 |
| 2009 | 5.16 | 9.84 | 17.54 | 19.50 |
| 2011 | 5.98 | 5.27 | 17.50 | 20.65 |
| 2013 | 6.27 | 8.75 | 8.93 | 15.90 |
| 2015 | 6.76 | 3.70 | 14.50 | 5.78 |
| 2017 | 1.15 | 0.51 | 8.69 | 3.62 |
| 2019 | 0.61 | 2.94 | 5.02 | 8.86 |
| 2021 | 2.93 | 3.77 | 3.01 | 8.11 |
| 2023 ^{b/} | 3.95 | NA | 6.14 | NA |

a/ Total run size.

b/ Preliminary forecasts

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 2022 ocean salmon season between the U.S./Canada border and the U.S./Mexico border. The management measures relate to three fishery sectors: non-Indian commercial (Table V-1), recreational (Table V-2), and treaty Indian (Table V-3). A description of the 2022 preseason management measures and analyses of their projected effects on the biological and socioeconomic environment are presented in Preseason Report III (PFMC 2022c). A description of the 2022 management measures as implemented, including inseason modifications, and an analysis of their effects on the environment, including a historical perspective, is presented in the SAFE document - Review of 2022 Ocean Salmon Fisheries (PFMC 2023).

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

5.1.1 Overview

Table V-4 provides a summary, where possible, of Salmon FMP stock spawning escapement and exploitation rate projections for 2023 under the No-Action Alternative (2022 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 2022 Ocean Salmon Fisheries (PFMC 2023) was published. A preliminary determination of stock status under the FMP Status Determination Criteria (SDC) was available for some of these stocks in time for this report; however, some estimates remain unavailable. The STT will report to the Council on the status of stocks at the March 2023 Council meeting and may further update the status of stocks present in Table V-4 at that time.

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

Coho escapements and fishery impacts were forecast using the Coho FRAM. Abundance forecasts for 2023 were updated for Washington and Oregon stocks, but forecasts for Canadian stocks are unchanged from those employed for 2022 planning. Updated forecasts for Canadian stocks are expected to become available in March 2023. To provide information on the effects of changes in abundance forecasts, the final 2022 preseason regulatory package for ocean and inside fisheries was applied to 2023 projections of abundance.

5.1.2 Sacramento River Fall Chinook

A repeat of 2022 regulations would be expected to result in an escapement of 84,750 hatchery and natural area SRFC adults. This projection is lower than the minimum escapement level specified by the control rule for 2023, which is S_{MSY} (122,000), but greater than the 2023 preseason S_{ACL} (50,930; Tables V-4 and V-5). The geometric mean of the 2021 and 2022 spawning escapement estimates and the 2023 forecast spawning escapement under the No-Action Alternative is lower than the $MSST$ and S_{MSY} (Table V-4). The predicted SRFC exploitation rate under the No-Action Alternative is 50.1 percent, which is below the $MFMT$ (78.0 percent; Table V-4) but greater than the maximum allowable rate specified by the control rule for 2023 (28.1 percent). If the ocean fisheries were closed from January through August 2023 between Cape Falcon and the U.S./Mexico border, and Sacramento Basin fisheries were closed in 2023, the expected number of hatchery and natural area adult spawners would be 165,057.

The 2022 estimate of SRFC escapement was 61,850 hatchery and natural area adults, which is lower than the 2022 postseason S_{ACL} of 75,357, but greater than the S_{OFL} of 55,262 (Table V-5).

5.1.3 Sacramento River Winter Chinook

A repeat of 2022 regulations would be expected to result in an age-3 impact rate of 15.9 percent for the area south of Point Arena, California. The 2023 forecast age-3 impact rate under the No-Action Alternative is lower than the 2023 maximum allowable rate of 20.0 percent.

5.1.4 Klamath River Fall Chinook

A repeat of 2022 regulations, which included a river recreational harvest allocation of 22.5 percent of the non-tribal harvest and a tribal allocation of 50 percent of the overall adult harvest, would be expected to result in 17,792 natural area adult spawners. This projection is lower than the minimum escapement level specified by the control rule for 2023 (23,614) and S_{MSY} (40,700), but greater than the 2023 preseason S_{ACL} (8,396; Tables V-4 and V-5). The geometric mean of the 2021 and 2022 natural area adult spawner escapement estimates and the 2023 forecast spawning escapement under the No-Action Alternative is lower than the $MSST$ and S_{MSY} (Table V-4). The predicted KRFC exploitation rate under the No-Action Alternative is 32.2 percent, which is lower than the MFMT (71.0 percent; Table V-4) but greater than the maximum allowable rate specified by the control rule for 2023 (10.0 percent). If the ocean fisheries were closed from January through August 2023 between Cape Falcon and Point Sur, and the Klamath Basin fisheries (tribal and recreational) were closed in 2023, the expected number of natural area adult spawners would be 26,202.

The 2022 estimate of KRFC escapement was 22,051 natural area adults, which exceeds the 2022 postseason S_{ACL} of 12,917 (Table V-5).

5.1.5 California Coastal Chinook Stocks

The NMFS ESA consultation standard restricts the KRFC age-4 ocean harvest rate to no more than 16.0 percent to limit impacts on these stocks. The postseason estimate of this rate for 2022 is 38.2 percent. Applying 2022 regulations to the 2023 KRFC abundance results in an age-4 ocean harvest rate forecast of 12.3 percent. If the ocean fisheries were closed from January through August 2023 between Cape Falcon and Point Sur, the expected age-4 ocean harvest rate would be 0.3 percent (68 age-4 KRFC were harvested during the September through November 2022 period).

5.1.6 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 is assessed using peak spawner counts observed in standard index reaches for the respective complexes. For the southern Oregon coast Chinook stock complex, the FMP conservation objective is assessed using the escapement estimate at Huntley Park on the Rogue River. Forecasts are not available for all these stocks, but given recent trends, the escapement goals may not be met for all stocks in 2023 under 2022 fishing seasons.

5.1.7 Columbia River Chinook Stocks

The 2023 forecast for Columbia River spring Chinook originating from both below and above Bonneville dam is greater than the 2022 forecast. The 2023 forecasts for summer Chinook, tule fall Chinook, and bright fall Chinook are greater than the 2022 forecasts. The 2023 forecast for summer Chinook is greater than the 2022 forecast. The 2023 aggregate forecast for fall Chinook is also greater than the 2022 forecast. This trend also holds true for each of the fall Chinook stock aggregates, with the exception of LRW and MCB. Given these differences in forecasts for 2023 relative to 2022, applying 2022 regulations to the

forecasted 2023 abundance of Columbia River Chinook should result in ocean escapements meeting spawning escapement goals for all summer and fall Chinook stocks (Table V-4)

5.1.8 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. Thus, an evaluation of 2022 Council area management measures on projected 2023 abundance would not provide a useful comparison of fishery impacts in relation to conservation objectives.

5.1.9 Oregon Production Index Area Coho Stocks

Ocean fisheries were modeled with 2022 Council regulations and 2022 regulations for non-Council area fisheries. The 2023 OPI forecasts are similar to, but overall, slightly lower than the 2022 forecasts, with fewer hatchery fish but more natural fish expected. As a result, when the model is run with 2023 forecasted abundances and 2022 fishery regulations, the fishery impact rates on LCN coho, OCN coho, and SONCC coho populations were generally similar to or slightly higher than when run with 2022 forecasts. This provides some indication of the fishery impacts and fisheries planning relative to the conservation objectives in 2023. Under this scenario, the expected escapement is 202,900 for OCN coho (Table V-6). For Columbia River hatchery coho stocks, the predicted ocean exploitation rate (excluding the Buoy 10 and inriver fisheries) is 28.7 percent on the Columbia River early stock and 41.8 percent on the Columbia River late stock; total predicted exploitation rates are 50.3 percent and 50.9 percent for early and late stock respectively. Predicted ocean escapements (after Buoy 10) into the Columbia River in 2023 show that under 2022 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 2023 fisheries is no greater than 20.0 percent in the revised OCN coho matrix (Table V-8; Appendix A, Table A-4). Under 2022 fishery regulations and 2023 abundance forecasts, these exploitation rates are predicted to be 15.4 percent for OCN. The total allowable exploitation rate for the SONCC coho is 16 percent for the Trinity population and 15 percent for all other populations. When 2022 fishery regulations are modeled with 2023 forecasts, the resulting exploitation rates are 13.5 percent for the Trinity population and 8.7, 7.8, and 2.9 percent for the Klamath, Rogue, and all other populations, respectively. For all populations, the exploitation rate in marine fisheries is 2.9 percent.

The 2023 allowable LCN coho exploitation rate is expected to be 23.0 percent in the marine area and mainstem Columbia River fisheries combined pending NMFS ESA guidance. Under 2022 fishery regulations and 2023 abundance forecasts, the exploitation rate is predicted to be 14.4 percent for marine fisheries (excluding the Buoy 10 and inriver fisheries) using combined unmarked Columbia River hatchery stocks as the proxy. The LCN coho exploitation rate estimate for the Buoy 10 fishery would be 2.9 percent and the estimated exploitation rate in freshwater fisheries would be 1.6 percent. The total exploitation rate on LCN coho would be 18.8 percent, which is less than the assumed 23.0 percent allowable rate.

5.1.10 Washington Coast, Puget Sound, and Canadian Coho Stocks

Exploitation rate and ocean escapement expectations in relation to management goals for select naturally-spawning coho stocks, given 2023 preseason abundance forecasts and 2022 preseason projections for fishing patterns, are presented in Table V-6. The 2023 forecasts for Canadian coho stocks are not available but are assumed to be at 2022 levels for this analysis. More detailed fishery management goals for Council area coho stocks are listed in Appendix A.

Based on the geometric mean of the two most recent spawning escapement estimates and the 2023 forecasted spawning escapement under the No-Action Alternative, there are no coho stocks that meet the criteria for being at risk of approaching an overfished condition (Table V-4).

Under the No-Action Alternative, FMP exploitation rate conservation objectives applicable for 2023 would be met for all Puget Sound natural coho stocks with the exception of Skagit. Ocean escapements for Washington Coast natural coho stocks are above FMP spawning escapement conservation objectives. Management objectives for U.S. Puget Sound natural coho stocks subject to the PST are identical to FMP objectives and would be met under 2022 regulations for all stocks with the exception of Skagit; all coastal stocks also meet agreed-to PST management objectives under 2022 regulations.

The exploitation rate by U.S. fisheries south of the Canadian border on Interior Fraser (B.C.) coho is projected to be 9.5 percent, which is below the anticipated 10.0 percent allowable exploitation rate under the 2019 PST Southern Coho Management Plan. The Council area fisheries portion would be 4.7 percent.

5.1.11 Summary

The effects of projected impacts (where available) under 2022 fishery regulations and 2023 abundance forecasts are as follows:

- The projected SRFC exploitation rate under the no action alternative is higher than the maximum level specified by the control rule for 2023.
- SRFC are at risk of approaching an overfished condition.
- For SRWC, the predicted age-3 impact rate is lower than the maximum allowable rate specified by the control rule and thus meets the 2023 objective.
- The projected KRFC exploitation rate under the no action alternative is higher than the maximum level specified by the control rule for 2023.
- KRFC are at risk of approaching an overfished condition.
- All Puget Sound and Washington Coast natural coho stocks, with the exception of Skagit, would achieve S_{MSY} spawning escapement objectives.
- No Puget Sound or Washington Coast natural coho stocks would be at risk of approaching an overfished condition.
- OCN and LCN coho stocks would have projected exploitation rates that comply with anticipated ESA consultation standards.
- All coho stocks would have exploitation rates below the MFMT.
- All Puget Sound coho stocks, with the exception of Skagit would have exploitation rates that comply with the annual rates allowed under the FMP harvest rate matrix and the allowable levels under the 2019 PST Southern Coho Management Plan.
- All Washington coastal coho stocks would have exploitation rates that comply with the annual rates allowed under the 2019 PST Southern Coho Management Plan.

5.1.12 Conclusion

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

- The projected Sacramento River fall Chinook exploitation rate is above the control rule defined maximum for 2023.
- The projected Klamath River fall Chinook exploitation rate is above the control rule defined maximum for 2023.

- Skagit natural coho would not achieve S_{MSY} spawning escapement objectives and would exceed exploitation rate limits set forth under the FMP and the 2019 PST Southern Coho Management Plan..

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 2023 ocean salmon fishery management measures. An understanding of stock shortfalls and surpluses under the No-Action Alternative helps managers, advisors, and constituents construct viable alternatives to the status-quo management measures.

TABLE V-I. 2022 Commercial troll management measures for non-Indian ocean salmon fisheries - Council adopted.
(Page 1 of 9)

| A. SEASON DESCRIPTIONS | |
|---|--|
| North of Cape Falcon | |
| Supplemental Management Information | |
| <p>1. Overall non-Indian TAC: 54,000 Chinook and 200,000 coho marked with a healed adipose fin clip (marked).</p> <p>2. Non-Indian commercial troll TAC: 27,000 Chinook and 32,000 marked coho.</p> <p>3. For fisheries scheduled prior to May 16, 2022: See 2021 management measures, which are subject to inseason action and the 2022 season description described below.</p> | |
| <i>Model run: Coho-2229, Chin-2522</i> | |
| <ul style="list-style-type: none"> • May 1-15; • May 16 through the earlier of June 29, or 18,000 Chinook. No more than 6,040 of which may be caught in the area between the U.S./Canada border and the Queets River, and no more than 4,840 of which may be caught in the area between Leadbetter Pt. and Cape Falcon (C.8). <p>Open seven days per week (C.1).</p> <p>In the area between the U.S./Canada border and the Queets River the landing and possession limit is 80 Chinook per vessel per landing week (Thurs.-Wed.) (C.1, C.6).</p> <p>In the area between Leadbetter Pt. and Cape Falcon the landing and possession limit is 80 Chinook per vessel per landing week (Thurs.-Wed.) (C.1, C.6).</p> <p>All salmon, except coho (C.4, C.7). Chinook minimum size limit of 27 inches total length (B). See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3).</p> <p>When it is estimated that approximately 50% of the overall Chinook quota or any Chinook subarea guideline has been landed, inseason action may be considered to ensure the quota and subarea guidelines are not exceeded.</p> <p>In 2023, the season will open May 1 consistent with all preseason regulations in place in this area and subareas during May 16-June 29, 2022, including subarea salmon guidelines and quotas and weekly vessel limits except as described below for vessels fishing or in possession of salmon north of Leadbetter Point. This opening could be modified following Council review at its March and/or April 2023 meetings.</p> | |
| <p>U.S./Canada Border to Cape Falcon</p> <ul style="list-style-type: none"> • July 1 through the earlier of September 30, or 9,000 Chinook or 32,000 coho (C.8). <p>Open seven days per week. All salmon. Chinook minimum size limit of 27 inches total length. Coho minimum size limit of 16 inches total length (B, C.1). All coho must be marked with a healed adipose fin clip (C.8.d). No chum retention north of Cape Alava, Washington beginning August 1 (C.4, C.7). See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3).</p> <p>Landing and possession limit of 150 marked coho per vessel per landing week (Thurs.-Wed.) (C.1).</p> <p>When it is estimated that approximately 50% of the overall Chinook quota or any Chinook subarea guideline has been landed, inseason action may be considered to ensure the quota and subarea guidelines are not exceeded.</p> | |
| <p>For all commercial troll fisheries north of Cape Falcon:</p> <p>Mandatory closed areas include Salmon troll Yelloweye Rockfish Conservation Area, Cape Flattery, and Columbia Control Zones, and beginning August 8, Grays Harbor Control Zone (C.5).</p> <p>Vessels must land and deliver their salmon within 24 hours of any closure of this fishery.</p> <p>Vessels may not land fish east of the Sekiu River or east of the Megler-Astoria bridge.</p> <p>Vessels fishing or in possession of salmon <u>north</u> of Leadbetter Point must land and deliver all species of fish in a Washington port and must possess a Washington troll and/or salmon delivery license. <u>For delivery to Washington ports south of Leadbetter Point</u>, vessels must notify the Washington Department of Fish and Wildlife at 360-249-1215 prior to crossing the Leadbetter Point line with area fished, total Chinook, coho, and halibut catch aboard, and destination with approximate time of delivery. During any single trip, only one side of the Leadbetter Point line may be fished (C.11).</p> <p>Vessels fishing or in possession of salmon while fishing <u>south</u> of Leadbetter Point must land and deliver all species of fish within the area and south of Leadbetter Point, except that Oregon permitted vessels may also land all species of fish in Garibaldi, Oregon. All Chinook caught north of Cape Falcon and being delivered by boat to Garibaldi must meet the minimum legal total length of 28 inches for Chinook for south of Cape Falcon seasons unless the season in waters off Garibaldi have been closed for Chinook retention for more than 48 hours (C.1.).</p> <p><i>(Continued next page)</i></p> | |

TABLE 1. 2022 Commercial troll management measures for non-Indian ocean salmon fisheries – Council adopted. (Page 2 of 9)

| A. SEASON DESCRIPTIONS |
|--|
| North of Cape Falcon |
| <p>For all commercial troll fisheries north of Cape Falcon: <i>(continued)</i></p> <p>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 to notify ODFW within one hour of delivery or prior to transport away from the port of landing by either calling 541-857-2546 or sending notification via e-mail to nfalcon.trollreport@odfw.oregon.gov. 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).</p> <p>Vessels in possession of salmon <u>north of the Queets River</u> may not cross the Queets River line without first notifying WDFW at 360-249-1215 with area fished, total Chinook, coho and halibut catch aboard, and destination. Vessels in possession of salmon <u>south of the Queets River</u> may not cross the Queets River line without first notifying WDFW at 360-249-1215 with area fished, total Chinook, coho and halibut catch aboard, and destination. (C.11). Inseason actions may modify harvest guidelines in later fisheries to achieve or prevent exceeding the overall allowable troll harvest impacts (C.8).</p> |

| |
|---|
| TABLE 1. 2022 Commercial troll management measures for non-Indian ocean salmon fisheries – Council adopted. (Page 3 of 9) |
| A. SEASON DESCRIPTIONS |
| South of Cape Falcon |
| Supplemental Management Information |
| <ol style="list-style-type: none"> 1. Sacramento River fall Chinook spawning escapement of 198,694 hatchery and natural area adults. 2. Sacramento Index exploitation rate of 49.9%. 3. Klamath River recreational fishery allocation: 2,119 adult Klamath River fall Chinook. 4. Klamath tribal allocation: 9,434 adult Klamath River fall Chinook. 5. CA/OR share of Klamath River fall Chinook commercial ocean harvest: 65.5% / 34.5%. 6. Overall commercial troll coho TAC: 10,000 coho marked with a healed adipose fin clip (marked). 7. Fisheries may need to be adjusted to meet NMFS ESA consultation standards, FMP requirements, other management objectives, or upon receipt of new allocation recommendations from the California Fish and Game Commission. 8. For fisheries scheduled prior to May 16, 2022, see 2021 management measures, which are subject to inseason action and the 2022 season description described below. |
| <p>Cape Falcon to Heceta Bank line</p> <ul style="list-style-type: none"> • March 15-May 15; • May 21-31; • June 1-12, 18-30; • July 5-9, 17-21, 25-31; • August 4-11; • September 1-4, 11-14; • October 1-31 (C.9.a). <p>Open 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 salmon in the State of Oregon. See gear restrictions and definitions (C.2, C.3). Beginning September 1, no more than 100 Chinook allowed per vessel per landing week (Thurs.-Wed.).</p> <ul style="list-style-type: none"> • Mark-selective coho fishery open July 5-9, 17-21, 25-31, and August 4-11, or until a Cape Falcon to Humbug Mt. quota of 10,000 marked coho is met. If the coho quota for the combined area from Cape Falcon to Humbug Mt. of 10,000 marked coho is met, then the season continues for all salmon except coho on the remaining open days. <p>All salmon, all retained coho must be marked with a healed adipose fin clip (C.4, C.7). Coho minimum size limit of 16 inches total length, and Chinook minimum size limit of 28 inches total length (B, C.1). All vessels fishing in the area must land their salmon in the State of Oregon. See gear restrictions and definitions (C.2, C.3).</p> <p>Salmon trollers may take and retain or possess on board a fishing vessel no more than 30 coho per vessel per open period. All coho retained, possessed on a vessel, and landed must not exceed a 1:1 ratio with Chinook salmon that are retained and landed at the same time.</p> <p>In 2023, 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 2022. This opening could be modified following Council review at its March 2023 meeting.</p> |
| <p>Heceta Bank Line to Humbug Mt.</p> <ul style="list-style-type: none"> • May 1-15; • May 21-31; • August 4-11; • September 1-4, 11-14; • October 1-31 (C.9.a). <p>Open 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 salmon in the State of Oregon. See gear restrictions and definitions (C.2, C.3). Beginning September 1, no more than 100 Chinook allowed per vessel per landing week (Thurs.-Wed.).</p> <ul style="list-style-type: none"> • Mark-selective coho fishery open August 4-11; or Cape Falcon to Humbug Mt. quota of 10,000 marked coho. If the coho quota for the combined area from Cape Falcon to Humbug Mt. of 10,000 marked coho is met, then the season continues for all salmon except coho on the remaining open days. <p>All salmon, all retained coho must be marked with a healed adipose fin clip (C.4, C.7). Coho minimum size limit of 16 inches total length, and Chinook minimum size limit of 28 inches total length (B, C.1). All vessels fishing in the area must land their salmon in the State of Oregon. See gear restrictions and definitions (C.2, C.3).</p> <p>Salmon trollers may take and retain or possess on board a fishing vessel no more than 30 coho per vessel per open period. All coho retained, possessed on a vessel, and landed must not exceed a 1:1 ratio with Chinook salmon that are retained and landed at the same time.</p> <p>In 2023, 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 2022. This opening could be modified following Council review at its March 2023 meeting.</p> |

TABLE 1. 2022 Commercial troll management measures for non-Indian ocean salmon fisheries – **Council adopted.** (Page 4 of 9)

| A. SEASON DESCRIPTIONS |
|--|
| South of Cape Falcon |
| <p>Humbug Mt. to OR/CA Border (Oregon KMZ)</p> <ul style="list-style-type: none"> • March 15-April 30; • June 1-30, or the earlier of 800 Chinook quota; • July 1-31, or the earlier of 400 Chinook quota; • August 1-28, or the earlier of 250 Chinook quota (C.9.a). <p>Open seven days per week (Thurs.-Wed.). All salmon except coho (C.4, C.7). Chinook minimum size limit of 28 inches total length (B, C.1). See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3). Prior to June 1, all salmon caught in this area must be landed and delivered in the State of Oregon.</p> <p>June 1-August 28 weekly landing and possession limit of 50 Chinook per vessel per week (Thurs.-Wed.).</p> <p>Any remaining portion of Chinook quotas may be transferred inseason on an impact neutral basis to the next open quota period (C.8.b).</p> <p>All vessels fishing in this area during June, July, and August must land and deliver all salmon within this area or into Port Orford within 24 hours of any closure of this fishery and prior to fishing outside of this area.</p> <p>For all quota managed seasons, Oregon state regulations require fishers to notify ODFW within one hour of landing and prior to transport away from the port of landing by calling 541-857-2538 or sending notification via e-mail to kmzor.trollreport@odfw.oregon.gov, with vessel name and number, number of salmon by species, location of delivery, and estimated time of delivery.</p> <p>In 2023, 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 2022. This opening could be modified following Council review at its March 2023 meeting.</p> |
| <p>OR/CA Border to Humboldt South Jetty (California KMZ)</p> <ul style="list-style-type: none"> • Closed. <p>In 2023, the season will open May 1 through the earlier of May 31, or a 3,000 Chinook quota. Chinook minimum size limit of 27 inches total length (B, C.1). Landing and possession limit of 20 Chinook per vessel per day (C.8.f). Open five days per week (Fri.-Tue.). All salmon except coho (C.4, C.7). Any remaining portion of Chinook quotas may be transferred inseason on an impact neutral basis to the next open quota period (C.8.b). All fish caught in this area must be landed within the area, within 24 hours of any closure of the fishery (C.6), 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 an additional closure adjacent to the Smith River. This opening could be modified following Council review at its March or April 2023 meetings.</p> |
| <p>Humboldt South Jetty to Latitude 40°10' N</p> <ul style="list-style-type: none"> • Closed. <p>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).</p> |

TABLE 1. 2022 Commercial troll management measures for non-Indian ocean salmon fisheries – Council adopted. (Page 5 of 9)

| A. SEASON DESCRIPTIONS |
|--|
| <p>Latitude 40°10' N. to Point Arena (Fort Bragg)</p> <ul style="list-style-type: none"> • July 8-12, 21-25; • August 3-12, (C.9.b). <p>Open seven days per week. All salmon except coho (C.4, C.7). See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3). Chinook minimum size limit of 27 inches total length (B, C.1).</p> <p>All salmon must be landed in California and north of Point Arena (C.6, C.11).</p> <p>In 2023, the season will open April 16 for all salmon except coho (C.4, C.7). Chinook minimum size limit of 27 inches total length (B, C.1). Gear restrictions same as in 2022 (C.2, C.3). This opening could be modified following Council review at its March 2023 meeting.</p> |
| <p>Pt. Arena to Pigeon Pt. (San Francisco)</p> <ul style="list-style-type: none"> • July 8-12, 21-25; • August 3-12; • September 1-30 (C.9.b). <p>Open seven days per week. All salmon except coho (C.4, C.7). Chinook minimum size limit of 27 inches total length through August, then 26 inches thereafter (B, C.1). See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3).</p> <p>All salmon must be landed in California (C.6).</p> <p>During September, all salmon must be landed south of Point Arena (C.6, C.11).</p> <p>In 2023, the season will open May 1 for all salmon except coho (C.4, C.7). Chinook minimum size limit of 27 inches total length (B, C.1). Gear restrictions same as in 2022 (C.2, C.3). This opening could be modified following Council review at its March or April 2023 meeting.</p> <p>Point Reyes to Point San Pedro (Fall Area Target Zone)</p> <ul style="list-style-type: none"> • October 3-7, 10-14. <p>Open five days per week (Mon.-Fri.). All salmon except coho (C.4, C.7). Chinook minimum size limit of 26 inches total length (B, C.1). All salmon caught in this area must be landed between Point Arena and Pigeon Point (C.6, C.11). See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3).</p> |
| <p>Pigeon Point to U.S./Mexico Border (Monterey)</p> <ul style="list-style-type: none"> • May 1-5, 10-15, 20-24; • June 1-12; • July 8-12, 21-25; • August 3-12 (C.9.b). <p>Open seven days per week. All salmon except coho (C.4, C.7). Chinook minimum size limit of 27 inches total length (B, C.1). See compliance requirements (C.1) and gear restrictions and definitions (C.2, C.3). All salmon must be landed in California (C.6). All salmon caught in this area in the month of May must be landed within 24 hours of any closure of the fishery (C.6). During the months of May and June, all salmon caught in this area must be landed south of Point Arena (C.11).</p> <p>In 2023, the season will open May 1 for all salmon except coho (C.4, C.7). Chinook minimum size limit of 27 inches total length (B, C.1). Gear restrictions same as in 2022 (C.2, C.3). This opening could be modified following Council review at its March or April 2023 meeting.</p> <p>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).</p> |

TABLE V-I. 2022 Commercial troll management measures for non-Indian ocean salmon fisheries - Council adopted. (Page 6 of 9)

| B. MINIMUM SIZE (Inches) (See C.1) | | | | | |
|---|--------------|----------|--------------|----------|------|
| Area (when open) | Chinook | | Coho | | Pink |
| | Total Length | Head-off | Total Length | Head-off | |
| North of Cape Falcon | 27 | 20.5 | 16 | 12 | None |
| Cape Falcon to Humbug Mt. | 28 | 21.5 | 16 | 12 | None |
| Humbug Mt. to OR/CA Border | 28 | 21.5 | - | - | None |
| OR/CA Border to Humboldt South Jetty | - | - | - | - | - |
| Latitude 40°10' N. to Pt. Arena | 27 | 20.5 | - | - | 27 |
| Pt. Arena to Pigeon Pt. through August | 27 | 20.5 | - | - | 27 |
| Pt. Arena to Pigeon Pt. September-October | 26 | 19.5 | - | - | 26 |
| Pigeon Pt. to U.S./Mexico Border | 27 | 20.5 | - | - | 27 |

C. REQUIREMENTS, DEFINITIONS, RESTRICTIONS, OR EXCEPTIONS

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

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

C.2. Gear Restrictions:

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

C.3. Gear Definitions:

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

Troll fishing gear defined: One or more lines that drag hooks behind a moving fishing vessel engaged in trolling. In that portion of the fishery management area off Oregon and Washington, the line or lines must be affixed to the vessel and must not be intentionally disengaged from the vessel at any time during the fishing operation.

Spread defined: A single leader connected to an individual lure and/or bait.

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

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

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

C. REQUIREMENTS, DEFINITIONS, RESTRICTIONS, OR EXCEPTIONS (continued)**C.5. Control Zone Definitions:**

- a. *Cape Flattery Control Zone* - The area from Cape Flattery (48°23'00" N. lat.) to the northern boundary of the U.S. EEZ; and the area from Cape Flattery south to Cape Alava (48°10'00" N. lat.) and east of 125°05'00" 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).
- f. Waypoints for the 40 fathom regulatory line from Cape Falcon to Humbug Mt. (50 CFR 660.71 (k) (12)-(70), when in place.

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

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

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

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

C.7. Incidental Halibut Harvest: License applications for incidental harvest for halibut during commercial salmon fishing must be obtained from IPHC.

- a. During the 2022 salmon troll season, incidental harvest is authorized only during April, May, and June, and after June 30 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 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.
- b. Through May 15, 2022, consistent with regulations adopted in April 2021, license holders may land no more than 1 Pacific halibut per each 2 Chinook, except one Pacific halibut may be landed without meeting the ratio requirement, and no more than 35 halibut may be landed per trip.
- c. Beginning May 16, 2022, through the end of the 2022 salmon troll fishery, and beginning April 1, 2023, until modified through inseason action or superseded by the 2023 management measures, license holders may land or possess no more than one Pacific halibut per two Chinook, except one Pacific halibut may be possessed or landed without meeting the ratio requirement, and no more than 35 halibut may be possessed or landed per trip. Pacific halibut retained must be no less than 32 inches in total length (with head on).
- d. Incidental Pacific halibut catch regulations in the commercial salmon troll fishery adopted for 2022, prior to any 2022 inseason action, will be in effect when incidental Pacific halibut retention opens on April 1, 2023, unless otherwise modified by inseason action at the March 2023 Council meeting.
- e. "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 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 May, June, and/or July non-Indian commercial troll quotas in the Oregon or California KMZ may be transferred to the Chinook quota for the next open period if the transfer would not result in exceeding preseason impact expectations on any stocks.
- c. NMFS may transfer salmon between the recreational and commercial fisheries north of Cape Falcon if there is agreement among the areas' representatives on the Salmon Advisory Subpanel (SAS), and if the transfer would not result in exceeding preseason impact expectations on any stocks.
- d. The Council will consider inseason recommendations for special regulations for any experimental fisheries annually in March; proposals must meet Council protocol and be received in November the year prior.
- e. If retention of unmarked coho (adipose fin intact) is permitted by inseason action, the allowable coho quota will be adjusted to ensure preseason projected impacts on all stocks is not exceeded.
- f. Landing limits may be modified inseason to sustain season length and keep harvest within overall quotas.

TABLE 1. 2022 Commercial troll management Alternatives for non-Indian ocean salmon fisheries – Council adopted. (Page 9 of 9)

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.
- c. 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 Latitude 40°10' N.

C.11. Latitudes for geographical reference of major landmarks along the west coast. Majority of information from source: 2021 West Coast federal salmon regulations.

<https://www.fisheries.noaa.gov/action/fisheries-west-coast-states-west-coast-salmon-fisheries-2021-management-measures>

| | | | |
|--------------------------------|------------------|---------------------------------------|------------------|
| Cape Flattery, WA | 48°23'00" N lat. | Humboldt South Jetty, CA | 40°45'53" N lat. |
| Cape Alava, WA | 48°10'00" N lat. | 40°10' line (near Cape Mendocino, CA) | 40°10'00" N lat. |
| Queets River, WA | 47°31'42" N lat. | Horse Mountain, CA | 40°05'00" N lat. |
| Leadbetter Point, WA | 46°38'10" N lat. | Point Arena, CA | 38°57'30" N lat. |
| Cape Falcon, OR | 45°46'00" N lat. | Point Reyes, CA | 37°59'44" N lat. |
| South end Heceta Bank line, OR | 43°58'00" N lat. | Point San Pedro, CA | 37°35'40" N lat. |
| Humbug Mountain, OR | 42°40'30" N lat. | Pigeon Point, CA | 37°11'00" N lat. |
| Oregon-California border | 42°00'00" N lat. | Point Sur, CA | 36°18'00" N lat. |
| | | Point Conception, CA | 34°27'00" N lat. |

TABLE V-2. 2022 Recreational management measures for non-Indian ocean salmon fisheries - Council adopted.
(Page 1 of 5)

| A. SEASON DESCRIPTIONS |
|---|
| North of Cape Falcon |
| Supplemental Management Information |
| <p>1. Overall non-Indian TAC: 54,000 Chinook and 200,000 coho marked with a healed adipose fin clip (marked).</p> <p>2. Recreational TAC: 27,000 Chinook and 168,000 marked coho; all retained coho must be marked.</p> <p>3. Buoy 10 fishery opens August 1 with an expected landed catch of 55,000 marked coho in August and September.</p> |
| <p>U.S./Canada Border to Cape Alava (Neah Bay Subarea)</p> <ul style="list-style-type: none"> June 18 through earlier of September 30, or 17,470 marked coho subarea quota, with a subarea guideline of 6,110 Chinook (C.5). <p>Open seven days per week. All salmon, except no chum beginning August 1; two salmon per day. All 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).</p> <p>Beginning August 1, Chinook non-retention east of the Bonilla-Tatoosh line (C.4.a) during Council managed ocean fishery.</p> <p>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).</p> |
| <p>Cape Alava to Queets River (La Push Subarea)</p> <ul style="list-style-type: none"> June 18 through earlier of September 30, or 4,370 marked coho subarea quota, with a subarea guideline of 995 Chinook (C.5). <p>Open seven days per week. All salmon, except no chum beginning August 1; two salmon per day. All coho must be marked with a healed adipose fin clip (C.1). See gear restrictions and definitions (C.2, C.3). Chinook minimum size limit of 24 inches total length (B).</p> <p>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).</p> <ul style="list-style-type: none"> October 5 through earlier of October 8, or 125 Chinook quota (C.5) in the area north of 47°50'00" N. lat. and south of 48°00'00" N. lat. <p>Open seven days per week. Chinook only, 2 Chinook per day. See gear restrictions and definitions (C.2, C.3). Chinook minimum size limit of 24 inches total length (B, C.1).</p> |
| <p>Queets River to Leadbetter Point (Westport Subarea)</p> <ul style="list-style-type: none"> July 2 through earlier of September 30, or 62,160 marked coho subarea quota, with a subarea guideline of 12,070 Chinook (C.5). <p>Open seven days per week. All salmon; two salmon per day, no more than one of which may be a Chinook. All coho must be marked with a healed adipose fin clip (C.1). See gear restrictions and definitions (C.2, C.3). Chinook minimum size limit of 22 inches total length (B).</p> <p>Grays Harbor Control Zone closed beginning August 8 (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).</p> |
| <p>Leadbetter Point to Cape Falcon (Columbia River Subarea)</p> <ul style="list-style-type: none"> June 25 through earlier of September 30, or 84,000 marked coho subarea quota, with a subarea guideline of 7,700 Chinook (C.5). <p>Open seven days per week. All salmon; two salmon per day, no more than one of which may be a Chinook. All coho must be marked with a healed adipose fin clip (C.1). See gear restrictions and definitions (C.2, C.3). Chinook minimum size limit of 22 inches total length (B).</p> <p>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).</p> |

| |
|--|
| TABLE 2. 2022 Recreational management measures for non-Indian ocean salmon fisheries – Council adopted. (Page 2 of 5) |
| South of Cape Falcon |
| Supplemental Management Information |
| <ol style="list-style-type: none"> 1. Sacramento River fall Chinook spawning escapement of 198,694 hatchery and natural area adults. 2. Sacramento Index exploitation rate of 49.9%. 3. Klamath River recreational fishery allocation: 2,119 adult Klamath River fall Chinook. 4. Klamath tribal allocation: 9,434 adult Klamath River fall Chinook. 5. Overall recreational coho TAC: 100,000 coho marked with a healed adipose fin clip (marked), and 17,000 coho in the non-mark-selective coho fishery. 6. Fisheries may need to be adjusted to meet NMFS ESA consultation standards, FMP requirements, other management objectives, or upon receipt of new allocation recommendations from the CFGC. 7. For fisheries scheduled prior to May 16, 2022, see 2021 management measures, which are subject to inseason action and the 2022 season description described below. |
| A. SEASON DESCRIPTIONS |
| South of Cape Falcon |
| <p>Cape Falcon to Humbug Mt.</p> <ul style="list-style-type: none"> • March 15-May 15; • May 16-October 31 (C.6). <p>Open seven days per week. All salmon except coho, except as provided below during the all-salmon mark-selective coho fishery and the non-mark-selective coho fishery (C.5), 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).</p> <p>In 2023, the season will open March 15 for all salmon except coho, two salmon per day (C.1). Chinook minimum size limit of 24 inches total length (B); and the same gear restrictions as in 2022 (C.2, C.3). This opening could be modified following Council review at its March 2023 meeting.</p> |
| <p>Cape Falcon to OR/CA Border.</p> <p>All-salmon mark-selective coho fishery:</p> <ul style="list-style-type: none"> • June 18 through the earlier of August 21, or 100,000 marked coho quota (C.6). <p>Open seven days per week. Cape Falcon to Humbug Mt.: All salmon two salmon per day. Humbug Mt. to OR/CA Border: June 18-24, all salmon except Chinook, two salmon per day; and June 25-August 21 or coho quota, all salmon, two salmon per day. All retained coho must be marked with a healed adipose fin clip. See minimum size limits (B). See gear restrictions and definitions (C.2, C.3).</p> <p>Any remainder of the mark-selective coho quota may be transferred inseason on an impact neutral basis to the non-selective coho quota from Cape Falcon to Humbug Mountain (C.5).</p> |
| <p>Cape Falcon to Humbug Mt.</p> <p>Non-mark-selective coho fishery:</p> <ul style="list-style-type: none"> • September 3 through the earlier of September 30, or 17,000 non-mark-selective coho quota (C.6). Open days may be modified inseason. <p>Open seven days per week. All salmon, two salmon per day (C.1). See minimum size limits (B). See gear restrictions and definitions (C.2, C.3).</p> |
| <p>Humbug Mt. to OR/CA Border (Oregon KMZ)</p> <ul style="list-style-type: none"> • June 25-August 21 (C.6). <p>Open seven days per week. All salmon except coho, except as listed above for the mark-selective coho fishery. From Cape Falcon to the OR/CA Border (June 18-August 21). Two salmon per day (C.1). Chinook minimum size limit of 24 inches total length (B). See gear restrictions and definitions (C.2, C.3).</p> |
| <p>For Recreational Fisheries from Cape Falcon to Humbug Mt.: Fishing in the Stonewall Bank yelloweye rockfish conservation area restricted to trolling only on days the all depth recreational halibut fishery is open (call the halibut fishing hotline 1-800-662-9825 for specific dates) (C.3.b, C.4.d).</p> |

TABLE 2. 2022 Recreational management measures for non-Indian ocean salmon fisheries – Council adopted. (Page 3 of 5)

| A. SEASON DESCRIPTIONS |
|--|
| <p>OR/CA Border to latitude 40°10' N. (California KMZ)</p> <ul style="list-style-type: none"> • May 1-May 15; • May 16-31; • August 1-September 5 (C.6). <p>Open seven days per week. All salmon except coho, two salmon per day (C.1). Chinook minimum size limit of 20 inches total length (B). See gear restrictions and definitions (C.2, C.3).</p> <p>Klamath Control Zone closed in August (C.4.e). See California State regulations for additional closures adjacent to the Smith, Eel, and Klamath Rivers.</p> <p>In 2023, season opens May 1 for all salmon except coho, two salmon per day (C.1). Chinook minimum size limit of 20 inches total length (B); and the same gear restrictions as in 2022 (C.2, C.3). This opening could be modified following Council review at its March or April 2023 meeting.</p> |
| <p>Latitude 40°10' N. to Point Arena (Fort Bragg)</p> <ul style="list-style-type: none"> • May 1-15; • May 16-July 4; • July 22-September 5 (C.6). <p>Open seven days per week. All salmon except coho, two salmon per day (C.1). Chinook minimum size limit of 20 inches total length (B). See gear restrictions and definitions (C.2, C.3).</p> <p>In 2023, season opens April 1 for all salmon except coho, two salmon per day (C.1). Chinook minimum size limit of 20 inches total length (B); and the same gear restrictions as in 2022 (C.2, C.3). This opening could be modified following Council review at its March 2023 meeting.</p> |
| <p>Point Arena to Pigeon Point (San Francisco)</p> <ul style="list-style-type: none"> • April 2-May 15 (C.6). <p>Open seven days per week. All salmon except coho, two salmon per day (C.1). Chinook minimum size limit of 24 inches total length (B). See gear restrictions and definitions (C.2, C.3).</p> <ul style="list-style-type: none"> • May 16-31; • June 23-October 31 (C.6). <p>Open seven days per week. All salmon except coho, two salmon per day (C.1). Chinook minimum size limit of 20 inches total length (B). See gear restrictions and definitions (C.2, C.3).</p> <p>In 2023, season opens April 1 for all salmon except coho, two salmon per day (C.1). Chinook minimum size limit of 24 inches total length (B); and the same gear restrictions as in 2022 (C.2, C.3). This opening could be modified following Council review at its March 2023 meeting.</p> |
| <p>Pigeon Point to U.S./Mexico Border (Monterey)</p> <ul style="list-style-type: none"> • April 2-May 15 (C.6). <p>Open seven days per week. All salmon except coho, two salmon per day (C.1). Chinook minimum size limit of 24 inches total length (B). See gear restrictions and definitions (C.2, C.3).</p> <ul style="list-style-type: none"> • May 16-October 2 (C.6). <p>Open seven days per week. All salmon except coho, two salmon per day (C.1). Chinook minimum size limit 20 inches total length. See gear restrictions and definitions (C.2, C.3).</p> <p>In 2023, season opens April 1 for all salmon except coho, two salmon per day (C.1). Chinook minimum size limit of 24 inches total length (B); and the same gear restrictions as in 2022 (C.2, C.3). This opening could be modified following Council review at its March 2023 meeting.</p> <p>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).</p> |

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

| Area (when open) | Chinook | Coho | Pink |
|--|---------|------|------|
| North of Cape Falcon (Westport and Columbia River) | 22 | 16 | None |
| North of Cape Falcon (Neah Bay and La Push) | 24 | 16 | None |
| Cape Falcon to Humbug Mt. | 24 | 16 | None |
| Humbug Mt. to OR/CA Border | 24 | 16 | None |
| OR/CA Border to Pt. Arena | 20 | - | 20 |
| Pt. Arena to Pigeon Pt. through May 15 | 24 | - | 24 |
| Pt. Arena to Pigeon Pt. beginning May 16 | 20 | - | 20 |
| Pigeon Pt. to U.S./Mexico Border through May 15 | 24 | - | 24 |
| Pigeon Pt. to U.S./Mexico Border beginning May 16 | 20 | - | 20 |

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.
- 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.
 - Latitude 40°10' N. to Pt. Conception, California*: Single point, single shank, barbless circle hooks (see gear definitions below) are required when fishing with bait by any means other than trolling, and no more than two such hooks shall be used. When angling with two hooks, the distance between the hooks must not exceed five inches when measured from the top of the eye of the top hook to the inner base of the curve of the lower hook, and both hooks must be permanently tied in place (hard tied). Circle hooks are not required when artificial lures are used without bait.
- C.3. Gear Definitions:
- 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.
 - 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.
 - 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. REQUIREMENTS, DEFINITIONS, RESTRICTIONS, OR EXCEPTIONS (continued)

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 offshore); 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 (adipose fin intact) coho. To remain consistent with preseason expectations, any inseason action shall consider, if significant, the difference between observed and preseason forecasted (adipose-clipped) mark rates. Such a consideration may also include a change in bag limit of two salmon, no more than one of which may be a coho.
- e. Marked coho remaining from the Cape Falcon to 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. 2022 Treaty Indian ocean troll management measures for ocean salmon fisheries - Council adopted. (Page 1 of 2)

| A. SEASON ALTERNATIVE DESCRIPTIONS | |
|---|--|
| Supplemental Management Information | |
| <p>1. Overall Treaty-Indian TAC: 40,000 Chinook and 52,000 coho.</p> <p>2. Overall Chinook and/or coho TACs may need to be reduced or fisheries adjusted to meet NMFS ESA guidance, FMP requirements, upon conclusion of negotiations in the North of Falcon forum, or upon receipt of preseason catch and abundance expectations for Canadian and Alaskan fisheries.</p> <p>3. In 2023, the season will open May 1, consistent with all preseason regulations in place for Treaty Indian Troll fisheries during May 16-June 30, 2022. All catch in May 2023 applies against the 2023 Treaty Indian Troll fisheries quota. This opening could be modified following Council review at its March and/or April 2023 meetings.</p> | |
| <ul style="list-style-type: none"> May 1 through the earlier of June 30 or 20,000 Chinook quota. <p>All salmon may be retained except coho. If the Chinook quota is exceeded, the excess will be deducted from the later all-salmon season (C.5). See size limit (B) and other restrictions (C).</p> <ul style="list-style-type: none"> July 1 through the earlier of September 15, or 20,000 Chinook quota or 52,000 coho quota <p>All salmon. See size limit (B) and other restrictions (C).</p> | |

| B. MINIMUM LENGTH (TOTAL INCHES) | | | | | |
|----------------------------------|----------------|----------------|----------------|----------------|------|
| Area (when open) | Chinook | | Coho | | Pink |
| | Total Length | Head-off | Total Length | Head-off | |
| North of Cape Falcon | 24.0 (61.0 cm) | 18.0 (45.7 cm) | 16.0 (40.6 cm) | 12.0 (30.5 cm) | None |

C. REQUIREMENTS, DEFINITIONS, RESTRICTIONS, OR EXCEPTIONS

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

S'KLALLAM - Washington State Statistical Area 4B (defined to include those waters of Puget Sound easterly of a line projected from the Bonilla Point light on Vancouver Island to the Tatoosh Island light, thence to the most westerly point on Cape Flattery and westerly of a line projected true north from the fishing boundary marker at the mouth of the Sekiu River [WAC 220-301-030]).

MAKAH - Washington State Statistical Area 4B and that portion of the FMA north of 48°02'15" N. lat. (Norwegian Memorial) and east of 125°44'00" W. long.

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

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

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

- C.2. Gear restrictions

- Single point, single shank, barbless hooks are required in all fisheries.
- No more than eight fixed lines per boat.
- 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

- The quotas include troll catches by the S'Klallam and Makah Tribes in Washington State Statistical Area 4B from May 1 through September 15.
- The Quileute Tribe may continue a ceremonial and subsistence fishery during the time frame of October 1 through October 15 in the same manner as in 2004-2015. Fish taken during this fishery are to be counted against treaty troll quotas established for the 2022 season (estimated harvest during the October ceremonial and subsistence fishery: 20 Chinook; 40 coho).

TABLE 3. 2022 Treaty Indian ocean troll management measures for ocean salmon fisheries - Council adopted. (Page 2 of 2)

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). Occurrences of stocks *at risk of* approaching an overfished condition or experiencing overfishing are indicated in **bold**. 2023 spawning escapement and exploitation rate estimates are based on preliminary 2023 preseason abundance forecasts and 2022 Council regulations.

| | Estimated Adult Spawning Escapement | | | | | | | | | | Total Exploitation Rate | | | | | | |
|---|-------------------------------------|---------|---------|---------|--------------------|--------------------------------|------------------|------------|------------------|--|-------------------------|------------------|------|------|--------------------|--------------------|------|
| | 2018 | 2019 | 2020 | 2021 | 2022 ^{a/} | Forecast 2023 ^{b/} | 3-yr Geo Mean | MSST | S _{MSY} | | 2018 | 2019 | 2020 | 2021 | 2022 ^{a/} | 2023 ^{b/} | MFMT |
| Chinook | | | | | | | | | | | | | | | | | |
| Sacramento Fall | 105,466 | 163,767 | 138,091 | 104,483 | 61,850 | 84,750 | 81,817 | 91,500 | 122,000 | | 0.52 | 0.68 | 0.61 | 0.68 | 0.75 | 0.50 | 0.78 |
| Klamath River Fall | 52,352 | 20,022 | 26,185 | 30,056 | 22,051 | 17,792 | 22,761 | 30,525 | 40,700 | | 0.32 | 0.43 | 0.30 | 0.38 | 0.45 | 0.32 | 0.71 |
| Southern Oregon ^{c/} | 39,507 | 18,436 | 29,387 | 48,979 | 17,615 | NA | 29,378 | 20,500 | 34,992 | | NA | NA | NA | NA | NA | NA | 0.78 |
| Central and Northern OR ^{d/} | 92 | 65 | 137 | 85 | 105 | NA | 107 | 30 fish/mi | 60 fish/mi | | 0.66 | 0.50 | 0.42 | NA | NA | NA | 0.78 |
| Upper River Bright - Fall ^{d/} | 58,540 | 77,880 | 98,401 | 86,644 | 53,961 | 99,945 | 77,600 | 19,182 | 39,625 | | 0.34 | 0.38 | 0.29 | NA | NA | NA | 0.86 |
| Upper River - Summer ^{d/} | 38,816 | 41,090 | 70,654 | 52,076 | 64,497 | 57,178 | 57,695 | 6,072 | 12,143 | | 0.44 | 0.17 | 0.30 | NA | NA | NA | 0.75 |
| Willapa Bay - Fall ^{e/} | 2,847 | 2,894 | 3,585 | 2,966 | NA | NA | 3,134 | 1,696 | 3,393 | | 0.61 | 0.66 | 0.51 | NA | NA | NA | 0.78 |
| Grays Harbor Fall ^{d/e/} | 20,741 | 14,880 | 20,879 | 13,207 | NA | NA | 16,009 | 5,694 | 13,326 | | 0.63 | 0.65 | 0.54 | NA | NA | NA | 0.78 |
| Grays Harbor Spring | 493 | 983 | 2,828 | 2,573 | NA | NA | 1,927 | 700 | 1,400 | | NA | NA | NA | NA | NA | NA | 0.78 |
| Queets - Fall ^{d/} | 2,207 | 2,663 | 3,622 | 3,364 | NA | NA | 3,190 | 1,250 | 2,500 | | 0.66 | 0.73 | 0.71 | NA | NA | NA | 0.87 |
| Queets - Sp/Su | 484 | 322 | 342 | 280 | NA | NA | 314 | 350 | 700 | | NA | NA | NA | NA | NA | NA | 0.78 |
| Hoh - Fall ^{d/e/} | 2,478 | 1,552 | 2,273 | 2,622 | NA | NA | 2,099 | 600 | 1,200 | | 0.56 | 0.73 | 0.64 | NA | NA | NA | 0.90 |
| Hoh Sp/Su | 793 | 766 | 1,248 | 817 | NA | NA | 921 | 450 | 900 | | NA | NA | NA | NA | NA | NA | 0.78 |
| Quillayute - Fall ^{d/e/} | 3,937 | 7,765 | 8,672 | 5,568 | 6,761 | NA | 6,886 | 1,500 | 3,000 | | 0.72 | 0.65 | 0.55 | NA | NA | NA | 0.87 |
| Quillayute - Sp/Su | 990 | 1,442 | 942 | 1,056 | 1,128 | NA | 1,039 | 600 | 1,200 | | NA | NA | NA | NA | NA | NA | 0.78 |
| Hoko -Su/Fa ^{d/} | 2,179 | 1,815 | 1,347 | 2,256 | NA | NA | 1,767 | 425 | 850 | | 0.57 | NA ^{g/} | 0.22 | NA | NA | NA | 0.78 |
| Coho | | | | | | | | | | | | | | | | | |
| Willapa Bay ^{f/} | 17,228 | 15,115 | 16,476 | 31,369 | NA | 28,005 | 24,370 | 8,600 | 17,200 | | 0.35 | 0.39 | 0.33 | 0.24 | NA | 0.53 | 0.74 |
| Grays Harbor ^{f/} | 49,622 | 30,468 | 23,814 | 62,762 | NA | 57,517 | 44,134 | 18,320 | 24,426 | | 0.22 | 0.39 | 0.29 | 0.23 | NA | 0.49 | 0.65 |
| Queets | 2,631 | 1,700 | 4,181 | 5,752 | NA | 7,956 | 5,762 | 4,350 | 5,800 | | 0.23 | 0.57 | 0.22 | 0.10 | NA | 0.36 | 0.65 |
| Hoh | 2,463 | 2,445 | 2,840 | 6,396 | NA | 3,057 | 3,815 | 1,890 | 2,520 | | 0.34 | 0.57 | 0.49 | 0.18 | NA | 0.54 | 0.65 |
| Quillayute Fall | 6,091 | 6,852 | 7,695 | 9,938 | 13,000 | 8,469 | 10,304 | 4,725 | 6,300 | | 0.30 | 0.37 | 0.16 | 0.04 | NA | 0.37 | 0.59 |
| Juan de Fuca | 5,470 | 4,625 | 8,548 | 20,837 | NA | 14,094 | 13,591 | 7,000 | 11,000 | | 0.08 | 0.12 | 0.07 | 0.07 | NA | 0.10 | 0.60 |
| Hood Canal | 7,512 | 7,884 | 17,312 | 35,178 | NA | 22,872 | 24,061 | 10,750 | 14,350 | | 0.57 | 0.46 | 0.29 | 0.25 | NA | 0.40 | 0.65 |
| Skagit | 19,047 | 14,246 | 23,808 | 75,532 | NA | 22,712 | 34,438 | 14,875 | 25,000 | | 0.49 | 0.48 | 0.43 | 0.33 | NA | 0.48 | 0.60 |
| Stillaguamish | 23,937 | 12,887 | 21,555 | 38,176 | NA | 23,080 | 26,680 | 6,100 | 10,000 | | 0.22 | 0.20 | 0.13 | 0.11 | NA | 0.24 | 0.50 |
| Snohomish | 58,135 | 40,314 | 42,675 | 97,523 | NA | 60,842 | 63,265 | 31,000 | 50,000 | | 0.25 | 0.17 | 0.11 | 0.11 | NA | 0.21 | 0.60 |

a/ Preliminary.

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

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

d/ Preliminary CWT based exploitation rates from PSC-CTC 2022 Exploitation Rate Analysis (TCCHINOOK (23)-01).

e/ Queets River fall Chinook coded-wire-tag (CWT) exploitation rates used as a proxy. Adjustments made to terminal fishery impacts to account for differential harvest rates.

f/ Willapa Bay and Grays Harbor coho escapement and exploitation rate estimates based on natural area adult spawners.

g/ Calculation of a reliable exploitation rate estimate was not possible due to insufficient CWT information.

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

| Year | SRFC | | | KRFC | | | Willapa Bay Coho | | |
|------|----------------|-----------|--------------------------|----------------|-----------|--------------------------|------------------|-----------|--------------------------|
| | $S_{ACL}^{a/}$ | S_{OFL} | Escapement ^{b/} | $S_{ACL}^{a/}$ | S_{OFL} | Escapement ^{c/} | $S_{ACL}^{a/}$ | S_{OFL} | Escapement ^{c/} |
| 2012 | 188,378 | 138,144 | 285,429 | 70,922 | 64,273 | 121,543 | -- | -- | -- |
| 2013 | 260,798 | 191,251 | 406,846 | 52,032 | 47,154 | 59,156 | -- | -- | -- |
| 2014 | 165,355 | 121,260 | 212,476 | 47,674 | 43,205 | 95,104 | -- | -- | -- |
| 2015 | 76,485 | 56,089 | 113,468 | 22,202 | 20,120 | 28,112 | 9,440 | 8,181 | 17,086 |
| 2016 | 61,595 | 45,170 | 89,699 | 7,056 | 6,394 | 13,937 | 14,839 | 12,860 | 30,667 |
| 2017 | 41,119 | 30,154 | 44,329 | 7,113 | 6,446 | 19,904 | 5,180 | 4,489 | 11,379 |
| 2018 | 66,110 | 48,481 | 105,466 | 24,468 | 22,174 | 52,352 | 7,903 | 6,849 | 17,228 |
| 2019 | 152,116 | 111,551 | 163,767 | 11,314 | 10,253 | 20,022 | 7,458 | 6,464 | 15,115 |
| 2020 | 105,746 | 77,547 | 138,091 | 12,014 | 10,887 | 26,185 | 7,399 | 6,413 | 16,476 |
| 2021 | 96,809 | 70,994 | 104,483 | 15,608 | 14,145 | 30,056 | 12,432 | 10,774 | 31,369 |
| 2022 | 75,357 | 55,262 | 61,850 | 12,917 | 11,706 | 22,051 | NA | NA | NA |
| 2023 | 50,930 | 37,349 | 84,750 | 8,396 | 7,609 | 17,792 | 17,825 | 15,448 | 28,005 |

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

b/ Hatchery and natural area adult spaw ners.

c/ Natural area adult spaw ners.

TABLE V-6. Comparison of projected ocean escapements and exploitation rates for critical natural and Columbia River hatchery coho stocks (thousands of fish) resulting from application of 2022 Council-adopted regulations to 2022 and 2023 ocean abundance forecasts.^{a/}

| Stock | Ocean Escapement and ER Estimates Under 2022 Regulations ^{b/} | | | | 2023 FMP Conservation Objective ^{c/} |
|-----------------------------|--|-------------------|--------------------------|-------------------|---|
| | 2022 Abundance Forecasts | | 2023 Abundance Forecasts | | |
| | Ocean Escapement | Exploitation Rate | Ocean Escapement | Exploitation Rate | |
| Natural Coho Stocks | | | | | |
| Skagit | 75.8 | 43.2% | 40.7 | 47.6% | Exploitation Rate ≤35.0% ^{d/} |
| Stillaguamish | 63.4 | 35.9% | 75.4 | 23.9% | Exploitation Rate ≤50.0% ^{d/} |
| Snohomish | 61.7 | 33.5% | 73.5 | 20.7% | Exploitation Rate ≤40.0% ^{d/} |
| Hood Canal | 18.9 | 44.1% | 35.4 | 39.9% | Exploitation Rate ≤45.0% ^{d/} |
| Strait of Juan de Fuca | 6.9 | 10.9% | 14.8 | 10.1% | Exploitation Rate ≤40.0% ^{d/} |
| Quillayute Fall | 11.6 | 37.4% | 12.6 | 37.4% | 6.3 - 15.8 Spaw ners |
| Hoh | 3.9 | 53.6% | 5.5 | 53.5% | 2.0 - 5.0 Spaw ners |
| Queets | 15.2 | 36.3% | 10.4 | 36.5% | 5.8 - 14.5 Spaw ners |
| Grays Harbor ^{f/} | 118.9 | 49.6% | 103.7 | 49.5% | 35.4 Spaw ners |
| LCN | 55.0 | 17.5% | 37.5 | 18.8% | Exploitation Rate ≤23.0 ^{e/} |
| OCN | 190.0 | 15.0% | 202.9 | 15.4% | Exploitation Rate ≤20.0% ^{e/} |
| SONCC | | | | | |
| Trinity Natural | -- | 13.5% | -- | 13.5% | Exploitation Rate ≤16.0% ^{e/} |
| Klamath Natural | -- | 8.7% | -- | 8.7% | Exploitation Rate ≤15.0% ^{e/} |
| Rogue Natural | -- | 7.8% | -- | 7.8% | Exploitation Rate ≤15.0% ^{e/} |
| Other Natural | -- | 2.9% | -- | 2.9% | Exploitation Rate ≤15.0% ^{e/} |
| Hatchery Coho Stocks | | | | | |
| Columbia Early | 379.2 | 50.6% | 302.7 | 50.3% | 6.2 Hatchery Escapement |
| Columbia Late | 241.1 | 46.6% | 223.6 | 50.9% | 14.2 Hatchery Escapement |

a/ Quota levels include harvest and hooking mortality estimates used in planning the Council's 2022 ocean fisheries and a coho catch for the Canadian troll fishery off the West Coast of Vancouver Island (WCVI).

b/ 2022 preseason regulations with the following coho quotas: U.S. Canada Border to Cape Falcon: Treaty Indian troll-52,000; non-Indian troll-32,000 selective; recreational-168,000 selective; Cape Falcon to OR/CA border: recreational-100,000 selective and 17,000 non-selective; troll-10,000 selective. Ocean escapement is generally the estimated number of coho escaping ocean fisheries and entering freshw ater. For Puget Sound stocks, ocean escapement is the total abundance minus ocean fisheries (ie outside Puget Sound). For the OCN coho stock, this value represents the estimated spaw ner 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.

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

d/ Assumed exploitation rate based on preliminary abundance forecasts.

e/ Pending confirmation of 2023 ESA consultation standard.

f/ Grays Harbor escapements and exploitation rate estimates based on natural area adult spaw ners.

TABLE V-7. Comparison of Lower Columbia natural (LCN), Oregon coastal natural (OCN), and Southern Oregon/Northern California Coastal (SONCC) coho projected harvest mortality and exploitation rates by fishery under Council-adopted 2022 regulations and preliminary 2023 preseason abundance estimates.

| Fishery | Projected Harvest Mortality and Exploitation Rate | | | | | | | |
|-------------------------------|---|---------|--------|---------|-----------------------------|---------|-------|-------|
| | LCN | | OCN | | SONCC Natural ^{a/} | | | |
| | Number | Percent | Number | Percent | Trinity | Klamath | Rogue | Other |
| SOUTHEAST ALASKA | 0 | 0.0% | 0 | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| BRITISH COLUMBIA | 62 | 0.1% | 699 | 0.3% | 0.1% | 0.1% | 0.1% | 0.1% |
| PUGET SOUND/STRAITS | 73 | 0.2% | 58 | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| NORTH OF CAPE FALCON | | | | | | | | |
| Recreational | 2,233 | 4.9% | 2,210 | 0.9% | 0.0% | 0.0% | 0.0% | 0.0% |
| Treaty Indian Troll | 946 | 2.1% | 1,168 | 0.5% | 0.0% | 0.0% | 0.0% | 0.0% |
| Non-Indian Troll | 744 | 1.6% | 796 | 0.3% | 0.0% | 0.0% | 0.0% | 0.0% |
| SOUTH OF CAPE FALCON | | | | | | | | |
| Recreational: | | | | | | | | |
| Cape Falcon to Humbug Mt. | 1,943 | 4.3% | 19,473 | 8.1% | 0.6% | 0.6% | 0.6% | 0.6% |
| Humbug Mt. to Horse Mt. (KMZ) | 43 | 0.1% | 896 | 0.4% | 1.1% | 1.1% | 1.1% | 1.1% |
| Fort Bragg | 12 | 0.0% | 445 | 0.2% | 0.4% | 0.4% | 0.4% | 0.4% |
| South of Pt. Arena | 4 | 0.0% | 229 | 0.1% | 0.2% | 0.2% | 0.2% | 0.2% |
| Troll: | | | | | | | | |
| Cape Falcon to Humbug Mt. | 444 | 1.0% | 2,326 | 1.0% | 0.1% | 0.1% | 0.1% | 0.1% |
| Humbug Mt. to Horse Mt. (KMZ) | 3 | 0.0% | 47 | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Fort Bragg | 2 | 0.0% | 225 | 0.1% | 0.2% | 0.2% | 0.2% | 0.2% |
| South of Pt. Arena | 8 | 0.0% | 323 | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| BUOY 10 | 1,295 | 2.9% | 388 | 0.2% | 0.0% | 0.0% | 0.0% | 0.0% |
| ESTUARY/FRESHWATER | 718 | 1.6% | 7,769 | 3.2% | 10.6% | 5.8% | 4.9% | 0.0% |
| TOTAL | 8,530 | 18.8% | 37,052 | 15.4% | 13.5% | 8.7% | 7.8% | 2.9% |

a/ Harvest mortality estimates not available.

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

| Fishery Year (t) | OCN Coho Spaw ners by Stock Component | | | | Marine Survival Indicator | | Amendment 13 Matrix | | | OCN Work Group Matrix ^{a/} | | |
|---------------------|---------------------------------------|----------|---------|-------------------|------------------------------|------------------------------------|--------------------------------|----------------------------------|----------------------------------|--|----------------------------------|----------------------------------|
| | Parent | | | | Hatchery Jack Survival | Predicted OCN Adult Survival | Marine Survival Category | Parental Spaw ner Category | Maximum Allow able Impacts | Marine Survival Category ^{b/c/} | Parental Spaw ner Category | Maximum Allow able Impacts |
| | Spaw ner Year (t-3) | Northern | Central | South- Central | | | | | | | | |
| 1998 | 1995 | 3,900 | 13,600 | 36,500 | 0.04% | - | Low | Very Low | ≤10-13% | Extremely Low | Very Low | ≤8% |
| 1999 | 1996 | 3,300 | 18,100 | 52,600 | 0.10% | - | Med | Very Low | ≤15% | Low | Critical | 0-8% |
| 2000 | 1997 | 2,100 | 2,800 | 18,400 | 0.12% | - | Med | Very Low | ≤15% | Low | Critical | 0-8% |
| 2001 | 1998 | 2,600 | 3,300 | 25,900 | 0.27% | - | Med | Very Low | ≤15% | Medium | Critical | 0-8% |
| 2002 | 1999 | 8,900 | 11,800 | 29,200 | 0.09% | - | Med | Low | ≤15% | Low | Low | ≤15% |
| 2003 | 2000 | 17,900 | 14,300 | 36,500 | 0.20% | - | Med | Low | ≤15% | Med | Low | ≤15% |
| 2004 | 2001 | 33,500 | 25,200 | 112,000 | 0.14% | - | Med | Low | ≤15% | Med | Low | ≤15% |
| 2005 | 2002 | 52,500 | 104,000 | 104,100 | 0.11% | - | Med | High | ≤20% | Low | High | ≤15% |
| 2006 | 2003 | 59,600 | 68,900 | 99,800 | 0.12% | - | Med | High | ≤20% | Low | High | ≤15% |
| 2007 | 2004 | 28,800 | 42,100 | 101,900 | 0.17% | - | Med | Med | ≤20% | Med | Med | ≤20% |
| 2008 | 2005 | 16,500 | 51,400 | 86,700 | 0.07% | - | Low | High | ≤15% | Extremely Low | High | ≤8% |
| 2009 | 2006 | 24,100 | 21,200 | 83,500 | 0.27% | - | Med | Low | ≤15% | Med | Low | ≤15% |
| 2010 | 2007 | 17,500 | 12,300 | 36,500 | 0.12% | - | Med | Low | ≤15% | Low | Low | ≤15% |
| 2011 | 2008 | 25,600 | 68,100 | 86,000 | 0.12% | - | Med | High | ≤20% | Low | High | ≤15% |
| 2012 | 2009 | 48,100 | 86,400 | 128,200 | 0.09% | - | Med | High | ≤20% | Low | High | ≤15% |
| 2013 | 2010 | 55,000 | 56,500 | 171,900 | 0.14% | 6.8% | Med | High | ≤20% | Med | High | ≤30% |
| 2014 | 2011 | 45,900 | 119,100 | 191,300 | 0.26% | 7.1% | Med | High | ≤20% | Med | High | ≤30% |
| 2015 | 2012 | 7,500 | 33,800 | 57,800 | 0.20% | 7.5% | Med | Low | ≤15% | Med | Low | ≤15% |
| 2016 | 2013 | 11,000 | 39,700 | 73,700 | 0.10% | 6.2% | Med | Med | ≤20% | Med | Med | ≤20% |
| 2017 | 2014 | 67,400 | 121,900 | 170,400 | 0.13% | 5.6% | Med | High | ≤30% | Med | High | ≤30% |
| 2018 | 2015 | 6,700 | 22,700 | 27,700 | 0.11% | 4.3% | Low | Low | ≤15% | Low | Low | ≤15% |
| 2019 | 2016 | 18,700 | 26,500 | 30,700 | 0.27% | 3.80% | Low | Low | ≤15% | Low | Low | ≤15% |
| 2020 | 2017 | 13,600 | 22,800 | 24,900 | 0.09% | 4.10% | Low | Low | ≤15% | Low | Low | ≤15% |
| 2021 | 2018 | 8,000 | 22,000 | 44,500 | 0.45% | 7.72% | High | Low | ≤15% | Med | Low | ≤15% |
| 2022 | 2019 | 22,300 | 20,100 | 52,800 | 0.31% | 6.98% | Med | Low | ≤15% | Med | Low | ≤15% |
| 2023 | 2020 | 21,500 | 30,800 | 57,600 | 0.30% | 7.87% | Med | Med | ≤20% | Med | Med | ≤20% |
| 2024 ^{a/} | 2021 | 42,800 | 88,600 | 110,800 | - | - | - | High | - | - | High | - |
| 2025 ^{a/} | 2022 | 46,700 | 70,000 | 45,300 | - | - | - | High | - | - | High | - |

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

b/ OCN workgroup matrix was modified during the 2012 methodology review. For 2013, the marine survival category is determined by a predicted OCN adult survival rate that is based on the 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.

d/ Preliminary.

REFERENCES

- DeFilippo, L.B., Buehrens, T.W., Scheuerell, M., Kendall, N.W., and D.E. Schindler. 2021. Improving short-term recruitment forecasts for coho salmon using a spatiotemporal integrated population model. *Fisheries Research* 242. <https://doi.org/10.1016/j.fishres.2021.106014>
- O'Farrell, M., Hendrix, N., and Mohr, M. 2016. An evaluation of preseason abundance forecasts for Sacramento River winter Chinook salmon. Report prepared for the 2016 Salmon Methodology Review. Pacific Fishery Management Council, Portland, Oregon. <https://www.pcouncil.org/documents/2016/11/agenda-item-d-2-attachment-1-an-evaluation-of-preseason-abundance-forecasts.pdf/>
- PFMC. 2014. Preseason Report I: Stock Abundance Analysis and Environmental Assessment - Part 1 for 2015 Ocean Salmon Fishery Regulations. Pacific Fishery Management Council, Portland, Oregon. <https://www.pcouncil.org/documents/2014/02/2014-preseason-report-i.pdf/>
- PFMC. 2021. Southern Oregon/Northern California Coast coho Salmon Workgroup Report: Fishery Harvest Control Rule. Pacific Fishery Management Council, Portland, Oregon. <https://www.pcouncil.org/documents/2021/10/f-3-a-soncc-workgroup-report-1-electronic-only-fishery-harvest-control-rule-risk-assessment.pdf/>
- PFMC. 2022a. Preseason Report I: Stock Abundance Analysis and Environmental Assessment - Part 1 for 2022 Ocean Salmon Fishery Regulations. Pacific Fishery Management Council, Portland, Oregon. <https://www.pcouncil.org/documents/2022/03/2022-preseason-report-i.pdf/>
- PFMC. 2022b. Preseason Report II: Proposed Alternatives and Environmental Assessment - Part 2 for 2022 Ocean Salmon Fishery Regulations. Pacific Fishery Management Council, Portland, Oregon. <https://www.pcouncil.org/documents/2022/03/2022-preseason-report-ii.pdf/>
- PFMC. 2022c. Preseason Report III: Council Adopted Management Measures and Environmental Assessment Part 3 for 2022 Ocean Salmon Fisheries. Pacific Fishery Management Council, Portland, Oregon. <https://www.pcouncil.org/salmon-management-documents/#safe>
- PFMC. 2023. Review of 2022 Ocean Salmon Fisheries: Stock Assessment and Fishery Evaluation Document for the Pacific Coast Salmon Fishery Management Plan. Pacific Fishery Management Council, Portland, Oregon. <https://www.pcouncil.org/salmon-management-documents/#safe>
- WDFW. 2023. 2023 Wild Coho Forecasts for Puget Sound, Washington Coast, and Lower Columbia. Washington Department of Fish and Wildlife, Olympia, Washington. <https://wdfw.wa.gov/publications/02406>

APPENDIX A

SUMMARY OF COUNCIL STOCK MANAGEMENT GOALS

LIST OF TABLES

| | <u>Page</u> |
|---|-------------|
| TABLE A-1. Conservation objectives and reference points governing harvest control rules and status determination criteria for salmon stocks and stock complexes | 103 |
| TABLE A-2. Allowable fishery impact rate criteria for OCN coho stock components under the Salmon Fishery Management Plan Amendment 13..... | 109 |
| 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..... | 111 |
| 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. | 111 |
| 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 | 112 |
| 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. | 112 |

LIST OF FIGURES

| | <u>Page</u> |
|---|-------------|
| FIGURE A-1. Sacramento River fall Chinook control rule. | 113 |
| FIGURE A-2. Klamath River fall Chinook control rule | 113 |
| FIGURE A-3. Sacramento River winter Chinook impact rate control rule..... | 114 |

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 6)

| 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; SRF CRT 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 |
| Central Valley 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. Guidance from NMFS in 2010 and 2011 required implementation of additional closures and/or increased sized limits in the recreational fishery South of Point Arena. The winter-run management framework and consultation standard is an abundance based age-3 impact rate control rule established in 2018 (NMFS 2018) which sets the maximum allowable age-3 impact rate based on the forecast age-3 escapement in the absence of fisheries: above 3,000, the allowable, impact rate is fixed at 20 percent; between 3,000 and 500, the allowable impact rate declines linearly from 20 percent to 10 percent; between 500 and 0, the allowable impact rate declines linearly from 10 percent to 0 percent. | 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) | |

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 6)

| CHINOOK | | | | | | |
|--|--|---|-----------------------------------|--------------------------|--|---|
| Stocks In The Fishery | Conservation Objective | S _{MSY} | MSST | MFMT (F _{MSY}) | ACL | |
| Southern Oregon | 41,000 escapement at Huntley Park, Gold Beach, Oregon | 34,992 | 20,500 | 78% Proxy (SAC 2011a) | Indicator stock is KRFC | |
| 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--MSP based on full seeding of spawning and rearing habitat (QDNR & WDFW 2014). | Annual natural spawning escapement targets may vary from FMP conservation objectives if agreed to by WDFW and treaty tribes under the provisions of <i>Hoh v. Baldrige</i> and subsequent U.S. District Court orders. | 13,326 | 6,663 | 63% | FNMC complex; international exception applies, ACLs are not applicable. |
| Queets Fall Indicator stock for the FNMC Chinook stock complex | Manage terminal fisheries for 40% harvest rate, but no less than 2,500 natural adult spawners, the MSY level estimated by Cooney (1984). | | 2,500 | 1,250 | 87% (Cooney 1984) | |
| Hoh Fall Indicator stock for the FNMC Chinook stock complex | Manage terminal fisheries for 40% harvest rate, but no less than 1,200 natural adult spawners, the MSY level estimated by Cooney (1984). | | 1,200 | 600 | 90% (Cooney 1984) | |
| Quillayute Fall Indicator stock for the FNMC Chinook stock complex | Manage terminal fisheries for 40% harvest rate, but no less than 3,000 natural adult spawners, the MSY level estimated by Cooney (1984). | | 3,000 | 1,500 | 87% (Cooney 1984) | |
| Hoko Summer/Fall Indicator stock for the FNMC Chinook stock complex | 850 natural adult spawners, the MSP level estimated by Ames and Phinney (1977). May include adults used for supplementation program. | | 850 | 425 | 78% Proxy (SAC 2011a) | |
| Grays Harbor Spring | 1,400 natural adult spawners. | | 1,400 | 700 | 78% Proxy (SAC 2011a) | FNMC complex; international exception applies, ACLs are not applicable. |
| Queets Sp/Su | Manage terminal fisheries for 30% harvest rate, but no less than 700 natural adult spawners. | | 700 | 350 | 78% Proxy (SAC 2011a) | |
| Hoh Spring/Summer | Manage terminal fisheries for 31% harvest rate, but no less than 900 natural adult spawners. | | 900 | 450 | 78% Proxy (SAC 2011a) | |
| Quillayute Spring/Summer | 1,200 natural adult spawners for summer component (MSY). | | 1,200 | 600 | 78% Proxy (SAC 2011a) | |

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 6)

| CHINOOK | | | | | |
|---|--|--------------------------------------|------------------------------------|--------------------------------------|---|
| Stocks In The Fishery | Conservation Objective | SMSY | MSST | MFMT (FMSY) | ACL |
| Willapa Bay Fall (hatchery) | 8,200 adult return to hatchery. WDFW spawning escapement objective of 9,800 hatchery spawners. | Not applicable to hatchery stocks | | | |
| Quinalt Fall (hatchery) | Hatchery production. | | | | |
| 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 | 12,600 adults for hatchery egg-take. | Not applicable to hatchery stocks | | | |
| Columbia Lower River Hatchery Spring | 2,700 adults to meet Cowlitz, Kalama, and Lewis Rivers broodstock needs. | | | | |
| Columbia Mid-River Bright Hatchery Fall | 4,700 adults for Bonneville Hatchery and 2,000 for Little White Salmon Hatchery egg-take. | | | | |
| Columbia Spring Creek Hatchery Fall | 7,000 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 6)

| 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 6)

Table A-1: Conservation objectives and reference points governing harvest control rules and status determination criteria for salmon stocks and stock complexes (Page 8 of 9)

| 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 | A total fishery (marine and freshwater) exploitation rate (ER) limit of 15 % for all populations within the SONCC Evolutionary Significant Unit, except the Trinity River coho population unit (Upper Trinity River, Lower Trinity River, SF Trinity River) which has a total fishery ER limit of 16 %, including landed and non-landed mortality of age-3 adult SONCC coho salmon in any individual year. No retention of coho in the EEZ south of the OR/CA border. Freshwater impacts determined using projections provided by co-managing agencies and tribes (i.e., the Oregon Department of Fish and Wildlife, Yurok Tribe, Hoopa Valley Tribe, California Department of Fish and Wildlife). | 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 14,200 adults. | | | | |
| Columbia River Early Hatchery | Hatchery rack return goal of 6,200 adults. | | | | |
| Willapa Bay - Hatchery | Hatchery rack return goal of 6,100 adults. | | | | |
| Quinalt - 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 6)

| 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]) | 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) | 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 | 5,800 (Johnstone 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 (Johnstone 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) | |
| 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) | |
| | | Allowable Total Fishery Impact Rate | | | |
| PARENT SPAWNER STATUS | | | | | |
| High: | Parent spawners achieved Level #2 rebuilding criteria; grandparent spawners achieved Level #1 | $\leq 15\%$ | $\leq 30\%$ ^{a/} | $\leq 35\%$ ^{a/} | |
| Medium: | Parent spawners achieved Level #1 or greater rebuilding criteria | $\leq 15\%$ | $\leq 20\%$ ^{a/} | $\leq 25\%$ ^{a/} | |
| Low: | Parent spawners less than Level #1 rebuilding criteria | $\leq 15\%$ | $\leq 15\%$ | $\leq 15\%$ | |
| | | $\leq 10\text{-}13\%$ ^{b/} | | | |
| | | | | | |
| OCN Coho Spawners by Stock Component | | | | | |
| Rebuilding Criteria | Northern | North-Central | South-Central | Southern | Total |
| Full Seeding at Low Marine Survival: | 21,700 | 55,000 | 50,000 | 5,400 | 132,100 |
| Level #2 (75% of full seeding): | 16,400 | 41,300 | 37,500 | 4,100 | 99,300 |
| Level #1 (50% of full seeding): | 10,900 | 27,500 | 25,000 | 2,700 | 66,100 |
| 38% of Level #1 (19% of full seeding): | 4,100 | 10,500 | 9,500 | 1,000 | 25,100 |
| | | | | | |
| Stock Component (Boundaries) | Full Seeding of Major Basins at Low Marine Survival (Number of Adult Spawners) | | | | |
| Northern: (Necanicum River to Neskowin Creek) | Nehalem 17,500 | Tillamook 2,000 | Nestucca 1,800 | Ocean Tribs. 400 | |
| North-Central: (Salmon River to Siuslaw River) | Siletz 4,300 | Yaquina 7,100 | Alsea 15,100 | Siuslaw 22,800 | Ocean Tribs. 5,700 |
| South-Central: (Siltcoos River to Sixes River) | Umpqua 29,400 | Coos 7,200 | Coquille 5,400 | Coastal Lakes 8,000 | |
| Southern: (Elk River to Winchuck River) | Rogue 5,400 | | | | |

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

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

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

Group 2000 Review of Amendment 15.

| 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 aggregate 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 subaggregates. 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-aggregate) 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 <i>(Wild adult coho salmon survival as predicted by the two-variable GAM ensemble forecast)</i> | | | | | |
|---|-------------------------------------|--|-----------------|---------------------|------------------------------|---------------------|---------------------|
| | | 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 <i>(Removed per adoption of Amendment 16)</i> | | | | | | | |
| 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 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| Low/normal runsize breakpoint | 27,445 | 41,000 | 62,500 | 20,000 | 125,000 |
| Low Exploitation Rate | 0.4 | 0.45 | 0.35 | 0.35 | 0.4 |
| Normal Exploitation Rate | 0.6 | 0.65 | 0.6 | 0.5 | 0.6 |

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

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

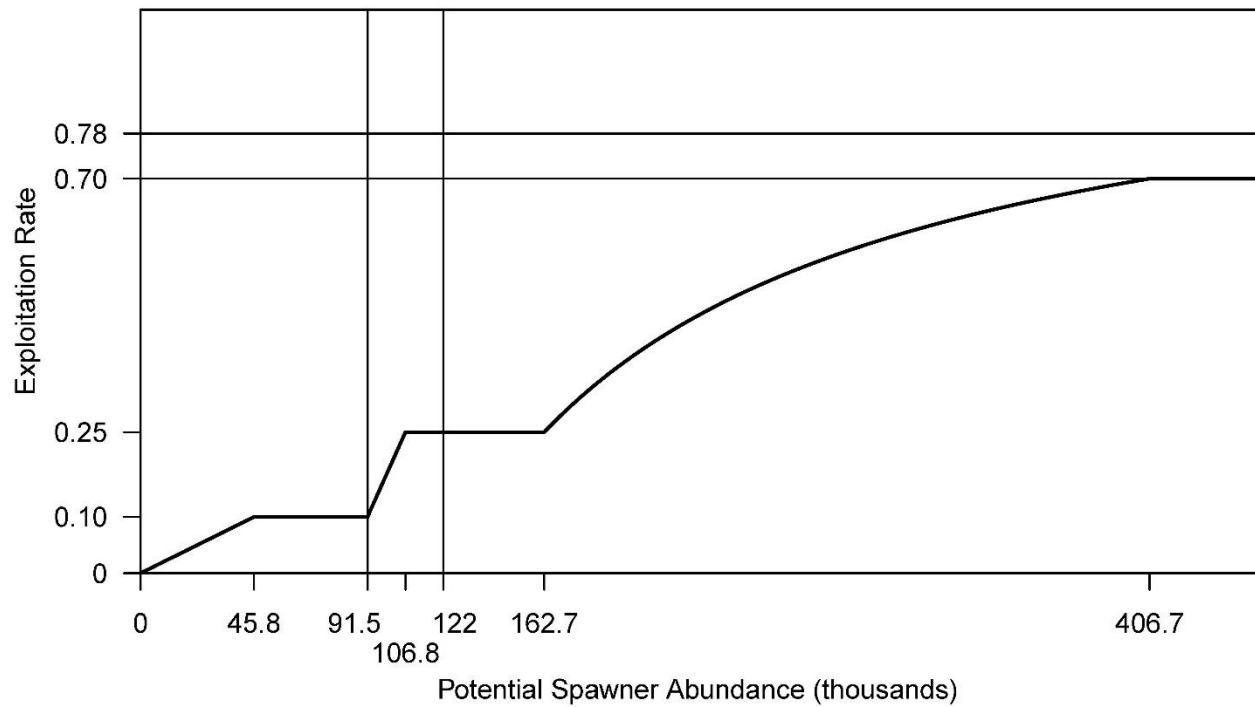


FIGURE A-1. Sacramento River fall Chinook control rule. Potential spawner abundance is the predicted hatchery and natural area adult spawners in the absence of fisheries, which is equivalent to the Sacramento Index. See the salmon FMP, Section 3.3.6, for control rule details.

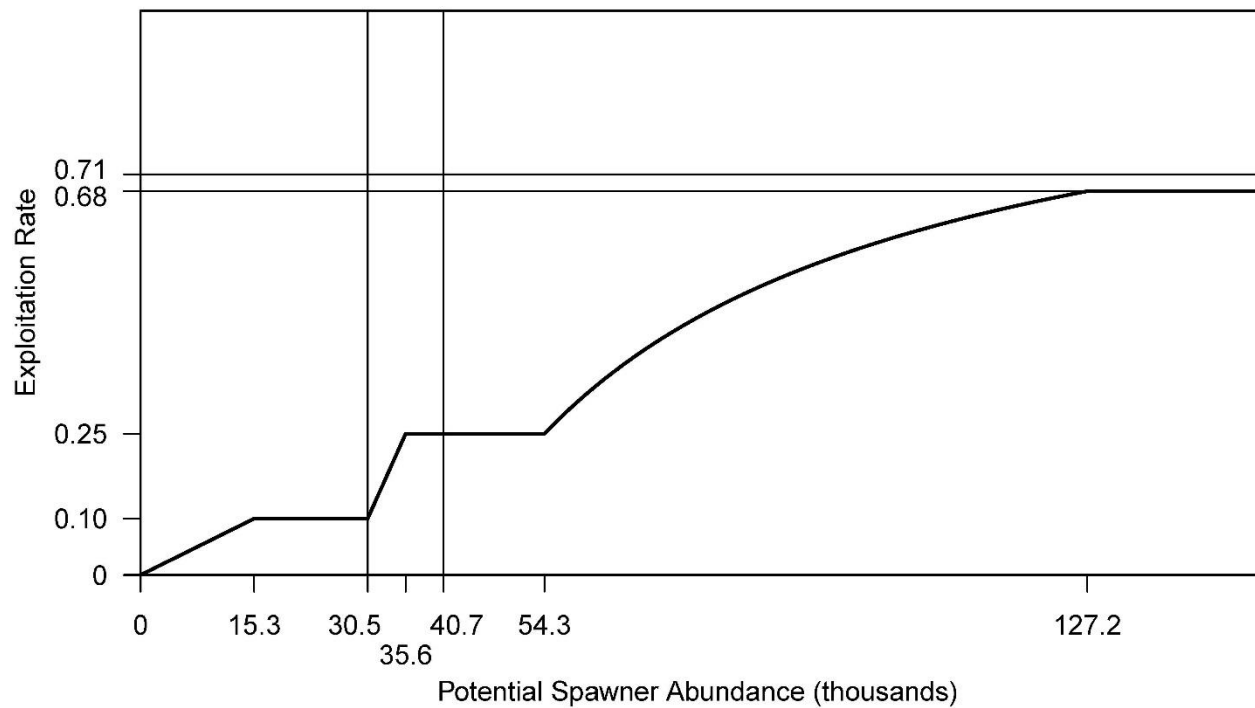


FIGURE A-2. Klamath River fall Chinook control rule. Potential spawner abundance is the predicted natural area adult spawners in the absence of fisheries. See the salmon FMP, Section 3.3.6, for control rule details.

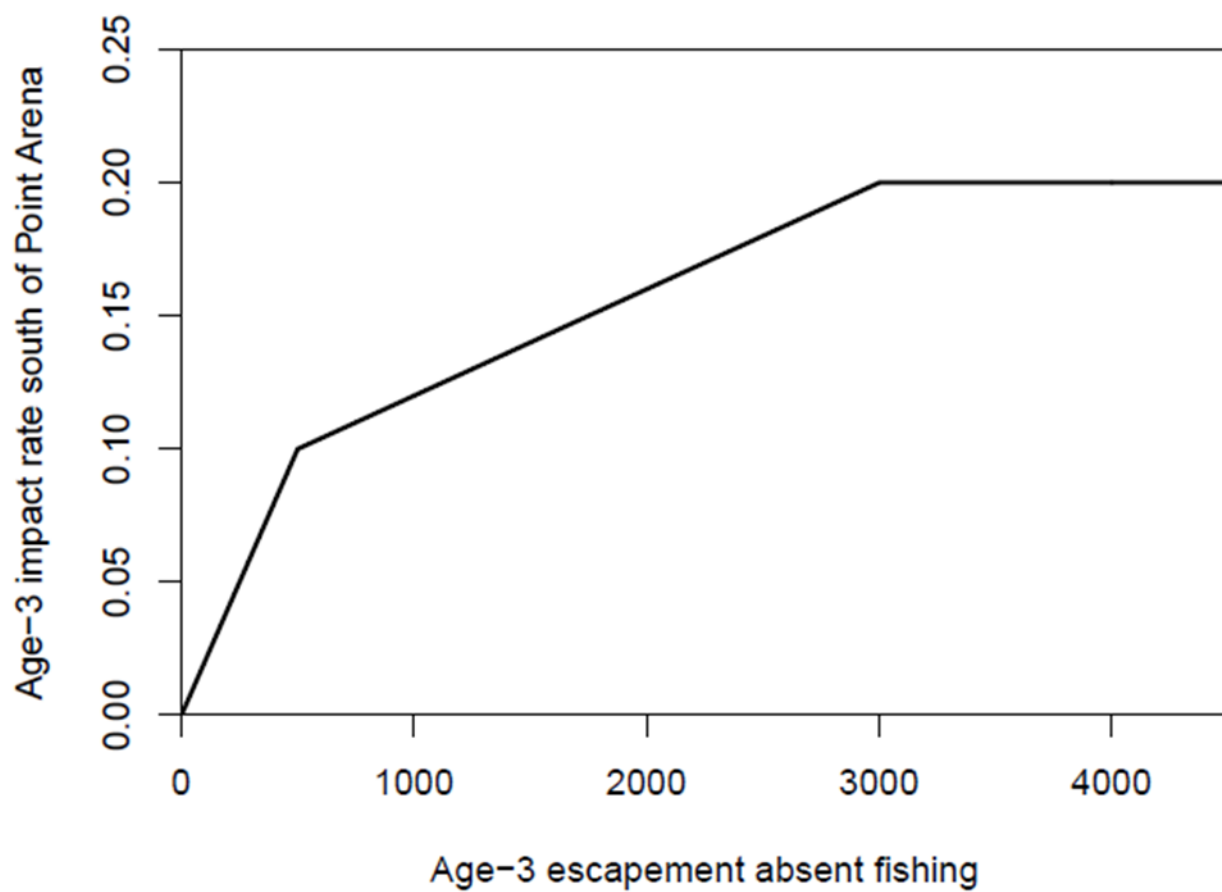


FIGURE A-3. Sacramento River winter Chinook impact rate control rule. The maximum forecast age-3 impact rate for the area south of Point Arena, California, is determined by the forecasted age-3 escapement absent fishing.

APPENDIX B

SALMON HARVEST ALLOCATION SCHEDULES

TABLE OF CONTENTS

| | <u>Page</u> |
|--|-------------|
| HARVEST ALLOCATION - SECTION 5.3 OF THE PACIFIC COAST SALMON FISHERY | |
| MANAGEMENT PLAN..... | 116 |
| 5.3 ALLOCATION..... | 116 |
| 5.3.1 Commercial (Non-Tribal) and Recreational Fisheries North of Cape Falcon | 116 |
| 5.3.1.1 Goal, Objectives, and Priorities..... | 116 |
| 5.3.1.2 Allocation Schedule Between Gear Types | 117 |
| 5.3.1.3 Recreational Subarea Allocations | 118 |
| 5.3.2 Commercial and Recreational Fisheries South of Cape Falcon..... | 119 |
| 5.3.3 Tribal Indian Fisheries | 122 |
| 5.3.3.1 California..... | 122 |
| 5.3.3.2 Columbia River | 122 |
| 5.3.3.3 U.S. v. Washington Area..... | 122 |
| MEASURES TO MANAGE THE HARVEST - SECTION 6.5 OF THE PACIFIC COAST | |
| SALMON FISHERY MANAGEMENT PLAN | 123 |
| 6.5 SEASONS AND QUOTAS..... | 123 |
| 6.5.1 Preferred Course of Action | 123 |
| 6.5.2 Procedures for Calculating Seasons..... | 123 |
| 6.5.3 Species-Specific and Other Selective Fisheries | 123 |
| 6.5.3.1 Guidelines..... | 123 |
| 6.5.3.2 Selective Fisheries Which May Change Allocation Percentages North of Cape Falcon | 124 |
| 6.5.4 Procedures for Calculating Quotas | 125 |
| 6.5.5 Procedures for Regulating Ocean Harvests of Pink and Sockeye | 125 |

5.3 ALLOCATION

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

Magnuson-Stevens Act, National Standard 4

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

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

5.3.1.1 Goal, Objectives, and Priorities

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

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

- Provide recreational opportunity by maximizing the duration of the fishing season while minimizing daily and area closures and restrictions on gear and daily limits.
- Maximize the value of the commercial harvest while providing fisheries of reasonable duration.

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

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

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

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

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

- Relax any restrictions in the recreational all-species fishery and/or extend the all-species season beyond Labor Day as coho quota allows. Provide Chinook to the recreational fishery for a Memorial Day through late June Chinook-only fishery. Adjust days per week to ensure continuity with the all-species season.
- Provide coho for an all-salmon troll season in late summer and/or access to a pink fishery. Leave adequate Chinook from the May through June season to allow access to coho.

5.3.1.2 Allocation Schedule Between Gear Types

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

TABLE 5-1. Initial commercial/recreational harvest allocation schedule north of Cape Falcon.

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

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

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

To provide flexibility to meet the dynamic nature of the fisheries and to assure achievement of the allocation objectives and fishery priorities, deviations from the allocation schedule will be allowed as provided below and as described in Section 6.5.3.2 for certain selective fisheries.

1. Preseason species trades (Chinook and coho) that vary from the allocation schedule may be made by the Council based upon the recommendation of the pertinent recreational and commercial SAS representatives north of Cape Falcon. The Council will compare the socioeconomic impacts of any such recommendation to those of the standard allocation schedule before adopting the allocation that best meets FMP management objectives.
2. Inseason transfers, including species trades of Chinook and coho, may be permitted in either direction between recreational and commercial fishery allocations to allow for uncatchable fish in one fishery to

be reallocated to the other. Fish will be deemed "uncatchable" by a respective commercial or recreational fishery only after considering all possible annual management actions to allow for their harvest which meet framework harvest management objectives, including single species or exclusive registration fisheries. Implementation of inseason transfers will require (1) consultation with the pertinent recreational and commercial SAS members and the STT, and (2) a clear establishment of available fish and impacts from the transfer.

3. An exchange ratio of four coho to one Chinook shall be considered a desirable guideline for preseason trades. Deviations from this guideline should be clearly justified. Inseason trades and transfers may vary to meet overall fishery objectives. (The exchange ratio of four coho to one Chinook approximately equalizes the species trade in terms of average ex-vessel values of the two salmon species in the commercial fishery. It also represents an average species catch ratio in the recreational fishery.)
4. Any increase or decrease in the recreational or commercial total allowable catch (TAC), resulting from an inseason restructuring of a fishery or other inseason management action, does not require reallocation of the overall north of Cape Falcon non-Indian TAC.
5. The commercial TACs of Chinook and coho derived during the preseason allocation process may be varied by major subareas (i.e., north of Leadbetter Point and south of Leadbetter Point) if there is a need to do so to decrease impacts on weak stocks. Deviations in each major subarea will generally not exceed 50 percent of the TAC of each species that would have been established without a geographic deviation in the distribution of the TAC. Deviation of more than 50 percent will be based on a conservation need to protect weak stocks and will provide larger overall harvest for the entire fishery north of Cape Falcon than would have been possible without the deviation. In addition, the actual harvest of coho may deviate from the initial allocation as provided in Section 6.5.3.2 for certain selective fisheries.
6. The recreational TACs of Chinook and coho derived during the preseason allocation process will be distributed among four major recreational port areas as described for coho and Chinook distribution in Section 5.3.1.3. The Council may deviate from subarea quotas (1) to meet recreational season objectives based on agreement of representatives of the affected ports and/or (2) in accordance with Section 6.5.3.2 with regard to certain selective fisheries. Additionally, based on the recommendations of the SAS members representing the ocean sport fishery north of Cape Falcon, the Council will include criteria in its preseason salmon management recommendations to guide any inseason transfer of coho among the recreational subareas to meet recreational season duration objectives. Inseason redistributions of quotas within the recreational fishery or the distribution of allowable coho catch transfers from the commercial fishery may deviate from the preseason distribution.

5.3.1.3 Recreational Subarea Allocations

Coho

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

In years with no Area 4B fishery, the distribution of coho north of Leadbetter Point (50 percent of the total recreational TAC) will be divided to provide 74 percent to the area between Leadbetter Point and the Queets River (Westport), 5.2 percent to the area between Queets River and Cape Flattery (La Push), and 20.8

percent to the area north of the Queets River (Neah Bay). In years when there is an Area 4B (Neah Bay) fishery under state management, the allocation percentages north of Leadbetter Point will be modified to maintain more equitable fishing opportunity among the ports by decreasing the ocean harvest share for Neah Bay. This will be accomplished by adding 25 percent of the numerical value of the Area 4B fishery to the recreational TAC north of Leadbetter Point prior to calculating the shares for Westport and La Push. The increase to Westport and La Push will be subtracted from the Neah Bay ocean share to maintain the same total harvest allocation north of Leadbetter Point. Table 5-2 displays the resulting percentage allocation of the total recreational coho catch north of Cape Falcon among the four recreational port areas (each port area allocation will be rounded to the nearest hundred fish, with the largest quotas rounded downward if necessary to sum to the TAC).

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

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

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

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

| Sport TAC North of Cape Falcon | Without Area 4B Add-On | | | | With Area 4B Add-On ^{a/} | | | | | |
|---|------------------------|----------|---------|-------------|-----------------------------------|----------|---------|--------|--------------------|--------|
| | Columbia River | Westport | La Push | Neah Bay | Columbia River | Westport | La Push | Ocean | Neah Bay 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 closures from 0 to 3, or 0 to 6, or 3 to 200, or 5 to 200 nautical miles from shore; closure from a point extending due west from Tatoosh Island for 5 miles, then south to a point due west of Umatilla Reef Buoy, then due east to shore; closure from North Head at the Columbia River mouth north to Leadbetter Point; change species that may be landed; or other actions as prescribed in the annual regulations.

5.3.2 Commercial and Recreational Fisheries South of Cape Falcon

The allocation of allowable ocean harvest of coho salmon south of Cape Falcon has been developed to provide a more stable recreational season and increased economic benefits of the ocean salmon fisheries at varying stock abundance levels. When coupled with various recreational harvest reduction measures or the timely transfer of unused recreational allocation to the commercial fishery, the allocation schedule is designed to help secure recreational seasons extending at least from Memorial Day through Labor Day when possible, assist in maintaining commercial markets even at relatively low stock sizes, and fully utilize available harvest. Total ocean catch of coho south of Cape Falcon will be treated as a quota to be allocated between troll and recreational fisheries as provided in Table 5-4.

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

TABLE 5-4. Allocation of allowable ocean harvest of coho salmon (thousands of fish) south of Cape Falcon.^{a/}

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

a/ The allocation schedule is based on the following formula: first 150,000 coho to the recreational base (this amount may be reduced as provided in footnote b); over 150,000 to 350,000 fish, share at 2:1, 0.667 to troll and 0.333 to recreational; over 350,000 to 800,000 the recreational share is 217,000 plus 14% of the available fish over 350,000; above 800,000 the recreational share is 280,000 plus 10% of the available fish over 800,000. Note: The allocation schedule provides guidance only when coho abundance permits a directed coho harvest, not when the allowable impacts are insufficient to allow general coho retention south of Cape Falcon. At such low levels, allocation of the allowable impacts will be determined in the Council's preseason process. Deviations from the allocation may also be allowed to meet consultation standards for ESA-listed stocks (e.g., the 1998 biological opinion for California coastal coho requires no retention of coho in fisheries off California).

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

c/ When the recreational allocation is 167,000 coho or less, special allocation provisions apply to the recreational harvest distribution by geographic area (unless superseded by requirements to meet a consultation standard for ESA-listed stocks); see text of FMP as modified by Amendment 11 allocation provisions.

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

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

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

1. Abundance of contributing stocks
2. Allocation considerations of concern to the Council
3. Relative abundance in the fishery between Chinook and coho
4. Escapement goals
5. Maximizing harvest potential

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

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

1. The recreational fisheries will be divided into two major subareas, as listed in #2 below, with independent quotas (i.e., if one quota is not achieved or is exceeded, the underage or overage will not be added to or deducted from the other quota; except as provided under #3 below).
2. The two major recreational subareas will be managed within the constraints of the following impact quotas, expressed as a percentage of the total recreational allocation (percentages based on avoiding large deviations from the historical harvest shares):
 - a. Central Oregon (Cape Falcon to Humbug Mountain) - 70 percent
 - b. South of Humbug Mountain - 30 percent

In addition,

- (1) Horse Mountain to Point Arena will be managed for an impact guideline of 3 percent of the south of Cape Falcon recreational allocation, and
- (2) There will be no coho harvest constraints south of Point Arena. However, the projected harvest in this area (which averaged 1,800 coho from 1986-1990) will be included in the south of Humbug Mountain impact quota.
3. Coho quota transfers can occur on a one-for-one basis between subareas if Chinook constraints preclude access to coho.

5.3.3 Tribal Indian Fisheries

5.3.3.1 California

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

5.3.3.2 Columbia River

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

parties to the agreement are the United States, the states of Oregon, Washington, and Idaho, and four Columbia River treaty Indian tribes-Warm Springs, Yakama, Nez Perce, and Umatilla.

5.3.3.3 *U.S. v. Washington Area*

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

The requirement for the opportunity to take up to 50 percent of the harvestable surplus determines the treaty shares available to the inside/outside Indian and all-citizen fisheries. Ocean coho harvest ceilings off the Washington coast for treaty Indians and all-citizen fisheries are independent within the constraints that (1) where feasible, conservation needs of all stocks must be met; (2) neither group precludes the other from the opportunity to harvest its share, and; (3) allocation schemes may be established to specify outside/inside sharing for various stocks.

6.5 SEASONS AND QUOTAS

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

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

6.5.1 Preferred Course of Action

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

6.5.2 Procedures for Calculating Seasons

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

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

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

6.5.3 Species-Specific and Other Selective Fisheries

6.5.3.1 Guidelines

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

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

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

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

1. Mark-Selective fisheries will first be considered during the months of May and/or June for Chinook and July through September for coho. However, the Council may consider mark-selective fisheries at other times, depending on year to year circumstances identified in the preceding paragraph.
2. The total impacts within each port area or gear group on the critical natural stocks of management concern are not greater than those under the original allocation without the mark-selective fisheries.

3. Other allocation objectives (i.e., treaty Indian, or ocean and inside allocations) are satisfied during negotiations in the North of Cape Falcon Forum.
4. The mark-selective fishery is assessed against the guidelines in Section 6.5.3.1.
5. Mark-selective fishery proposals need to be made in a timely manner in order to allow sufficient time for analysis and public comment on the proposal before the Council finalizes its fishery recommendations.

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

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

6.5.4 Procedures for Calculating Quotas

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

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

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

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

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

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

6.5.5 Procedures for Regulating Ocean Harvests of Pink and Sockeye

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

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

APPENDIX C
OREGON PRODUCTION INDEX DATA

LIST OF TABLES

| | <u>Page</u> |
|--|-------------|
| TABLE C-1. Millions of coho smolts released annually into the OPI area by geographic area and rearing agency | 128 |
| TABLE C-2. Data set used in predicting Oregon production index hatchery (OPIH) adult coho. | 129 |
| TABLE C-3. Estimated coho salmon natural spawner abundance in Oregon coastal basins for each OCN coho management section..... | 130 |
| 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..... | 131 |

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 | | | | |
|--------------------|----------------|------------|------|----------|---------|-------|--------------------|-----------|-------|------------|-----------|
| | Oregon | Washington | | | Federal | Total | ODFW ^{b/} | Private | | California | Total OPI |
| | | Early | Late | Combined | | | | Yearlings | Total | | |
| 1960-1965 | 5.6 | - | - | 6.1 | 4.5 | 16.2 | 2.0 | - | 2.0 | 0.4 | 18.6 |
| 1966-1970 | 6.0 | 10.2 | 4.9 | 15.1 | 6.5 | 27.6 | 2.9 | 0.0 | 2.9 | 1.3 | 31.8 |
| 1971-1975 | 6.8 | 10.7 | 6.8 | 17.5 | 4.5 | 28.8 | 3.9 | 0.0 | 3.9 | 1.2 | 33.9 |
| 1976-1980 | 8.0 | 7.3 | 10.1 | 17.4 | 4.7 | 30.1 | 3.8 | 1.4 | 5.2 | 0.7 | 36.0 |
| 1981-1985 | 7.1 | 4.3 | 14.4 | 18.7 | 3.2 | 29.0 | 3.9 | 3.3 | 7.2 | 0.7 | 36.9 |
| 1986-1990 | 7.3 | 3.1 | 15.6 | 18.7 | 4.1 | 30.1 | 5.2 | 1.9 | 7.1 | 1.4 | 38.6 |
| 1991-1995 | 9.8 | 3.6 | 13.9 | 17.5 | 3.5 | 30.8 | 4.9 | - | 4.9 | 0.9 | 36.6 |
| 1996-2000 | 7.2 | 4.5 | 10.9 | 15.4 | 4.3 | 26.9 | 2.0 | - | 2.0 | 0.6 | 29.4 |
| 2001 | 7.6 | 4.2 | 9.7 | 13.9 | 3.7 | 25.2 | 0.9 | - | 0.9 | 0.6 | 26.7 |
| 2002 | 7.5 | 3.3 | 8.6 | 11.9 | 4.3 | 23.7 | 1.0 | - | 1.0 | 0.6 | 25.3 |
| 2003 | 8.2 | 3.3 | 8.7 | 12.0 | 3.1 | 23.3 | 0.8 | - | 0.8 | 0.5 | 24.6 |
| 2004 | 6.7 | 3.0 | 8.8 | 11.8 | 3.6 | 22.1 | 0.8 | - | 0.8 | 0.6 | 23.5 |
| 2005 | 6.1 | 2.5 | 9.1 | 11.6 | 2.8 | 20.6 | 0.8 | - | 0.8 | 0.6 | 22.0 |
| 2006 | 6.1 | 2.8 | 9.0 | 11.7 | 2.6 | 20.4 | 0.8 | - | 0.8 | 0.6 | 21.8 |
| 2007 | 6.2 | 3.1 | 9.0 | 12.1 | 3.1 | 21.4 | 0.7 | - | 0.7 | 0.6 | 22.6 |
| 2008 | 6.9 | 2.8 | 9.2 | 12.0 | 2.9 | 21.9 | 0.4 | - | 0.4 | 0.5 | 22.8 |
| 2009 | 6.9 | 2.5 | 8.3 | 10.8 | 3.2 | 20.9 | 0.4 | - | 0.4 | 0.6 | 21.8 |
| 2010 | 5.9 | 2.0 | 7.5 | 9.5 | 3.1 | 18.6 | 0.3 | - | 0.3 | 0.5 | 19.4 |
| 2011 | 5.8 | 1.8 | 8.4 | 10.2 | 3.0 | 19.0 | 0.4 | - | 0.4 | 0.5 | 19.8 |
| 2012 | 5.9 | 2.2 | 7.4 | 9.7 | 2.7 | 18.2 | 0.4 | - | 0.4 | 0.6 | 19.3 |
| 2013 | 6.0 | 2.0 | 7.8 | 9.8 | 2.9 | 18.6 | 0.4 | - | 0.4 | 0.6 | 19.5 |
| 2014 | 6.5 | 1.5 | 7.4 | 8.9 | 3.0 | 18.4 | 0.4 | - | 0.4 | 0.6 | 19.4 |
| 2015 | 5.7 | 2.1 | 7.4 | 9.5 | 3.0 | 18.2 | 0.3 | - | 0.3 | 0.4 | 18.9 |
| 2016 | 5.7 | 2.2 | 6.9 | 9.1 | 3.0 | 17.7 | 0.3 | - | 0.3 | 0.3 | 18.3 |
| 2017 | 5.5 | 1.7 | 7.6 | 9.2 | 1.9 | 16.7 | 0.3 | - | 0.3 | 0.3 | 17.2 |
| 2018 | 6.1 | 2.1 | 7.3 | 9.4 | 3.6 | 19.2 | 0.3 | - | 0.3 | 0.3 | 19.8 |
| 2019 | 5.3 | 1.3 | 7.9 | 9.2 | 3.2 | 17.8 | 0.3 | - | 0.3 | 0.2 | 18.3 |
| 2020 | 5.6 | 1.2 | 8.2 | 9.4 | 3.6 | 18.5 | 0.3 | - | 0.3 | 0.4 | 19.2 |
| 2021 | 5.9 | 1.0 | 7.6 | 8.6 | 3.4 | 17.9 | 0.3 | - | 0.3 | 0.4 | 18.6 |
| 2022 ^{c/} | 4.7 | 0.9 | 8.0 | 8.9 | 3.5 | 17.1 | 0.3 | - | 0.3 | 0.4 | 17.7 |

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

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

c/ Preliminary.

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

| Year (t) or Average | Adults (t) | | Jacks (t-1) | | | Columbia River Smolts (t-1) | | | |
|-------------------------|--------------------|-------------------|-------------------------|---------------------------------|-------------------------------|-----------------------------|-------------------------------|-----------------------|---|
| | OPIH ^{a/} | MSM ^{b/} | Total OPI ^{c/} | Columbia River ^{d/} | OR Coast/ CA ^{e/} | Total OPI ^{f/} | Normal Timed ^{g/} | Delayed ^{h/} | Delayed Smolt Adjustment ^{i/} |
| 1970-1975 | 2,432.6 | - | 119.0 | 113.3 | 5.7 | 32.7 | 26.4 | 1.3 | 4.7 |
| 1976-1980 | 1,879.5 | - | 91.7 | 81.5 | 10.2 | 34.9 | 27.4 | 2.8 | 6.4 |
| 1981-1985 ^{j/} | 867.9 | - | 47.2 | 40.6 | 6.6 | 33.5 | 22.6 | 6.3 | 8.3 |
| 1986-1990 | 1,486.2 | 1,459.0 | 60.6 | 50.6 | 10.0 | 35.9 | 21.0 | 8.9 | 15.5 |
| 1991-1995 | 605.9 | 581.2 | 27.7 | 22.6 | 5.0 | 38.1 | 26.3 | 5.5 | 4.5 |
| 1996-2000 | 320.2 | 329.2 | 22.4 | 18.3 | 4.0 | 28.9 | 22.3 | 3.4 | 2.5 |
| 2001 | 1,417.1 | 1,478.7 | 87.4 | 71.7 | 15.7 | 32.2 | 28.7 | 2.0 | 4.7 |
| 2002 | 649.8 | 689.5 | 25.2 | 18.9 | 6.3 | 26.8 | 23.9 | 1.4 | 1.0 |
| 2003 | 936.6 | 1,009.9 | 49.9 | 41.7 | 8.2 | 25.3 | 23.4 | 0.3 | 0.5 |
| 2004 | 622.1 | 693.6 | 35.4 | 29.4 | 6.0 | 24.5 | 21.2 | 2.0 | 2.5 |
| 2005 | 443.2 | 454.0 | 25.0 | 21.2 | 3.8 | 23.4 | 21.2 | 0.8 | 0.8 |
| 2006 | 440.6 | 523.4 | 25.9 | 20.9 | 5.0 | 22.0 | 20.2 | 0.4 | 0.4 |
| 2007 | 476.6 | 545.3 | 36.3 | 34.2 | 2.2 | 21.8 | 20.3 | 0.1 | 0.2 |
| 2008 | 565.3 | 576.9 | 16.0 | 14.9 | 1.2 | 22.7 | 20.8 | 0.6 | 0.4 |
| 2009 | 1,066.2 | 1,051.0 | 60.4 | 58.4 | 2.0 | 22.8 | 20.8 | 1.1 | 2.9 |
| 2010 | 551.3 | 546.5 | 25.1 | 23.8 | 1.4 | 21.9 | 20.7 | 0.2 | 0.2 |
| 2011 | 442.3 | 454.2 | 23.3 | 22.2 | 1.1 | 19.3 | 18.2 | 0.3 | 0.4 |
| 2012 | 182.3 | 183.1 | 17.9 | 13.9 | 4.0 | 19.9 | 18.1 | 0.9 | 0.7 |
| 2013 | 316.9 | 335.1 | 26.3 | 24.1 | 2.2 | 19.2 | 17.1 | 1.1 | 1.5 |
| 2014 | 1,263.6 | 1,316.5 | 51.4 | 49.4 | 2.0 | 19.6 | 18.0 | 0.6 | 1.6 |
| 2015 | 251.7 | 268.9 | 39.6 | 37.0 | 2.6 | 19.4 | 16.9 | 1.5 | 3.0 |
| 2016 | 233.8 | 247.7 | 19.7 | 18.6 | 1.0 | 18.9 | 16.9 | 1.3 | 1.3 |
| 2017 | 284.8 | 291.8 | 22.9 | 22.4 | 0.4 | 18.4 | 16.5 | 1.3 | 1.6 |
| 2018 | 149.4 | 182.8 | 19.2 | 18.5 | 0.7 | 17.2 | 16.0 | 0.7 | 0.8 |
| 2019 | 300.5 | 340.7 | 47.4 | 46.7 | 0.8 | 19.7 | 18.6 | 0.5 | 1.2 |
| 2020 | 369.6 | 387.7 | 15.2 | 14.9 | 0.3 | 18.3 | 16.8 | 0.2 | 0.2 |
| 2021 | - | 841.3 | 92.3 | 89.1 | 3.2 | 19.2 | 18.1 | 0.4 | 1.9 |
| 2022 | - | 696.0 | 63.7 | 62.4 | 1.3 | 18.6 | 17.6 | 0.3 | 1.0 |
| 2023 ^{k/} | - | 896.9 | 52.7 | 51.9 | 0.8 | 17.6 | 16.8 | 0.3 | 0.9 |

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

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

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

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

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

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

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

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

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

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

k/ For MSM: Preseason predicted adults.

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

| Component and Basin ^{a/} | 2001- 2005 Ave. | 2006- 2010 Ave. | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 ^{b/} | 2021 ^{b/} | 2022 ^{b/d/} |
|--------------------------------------|-----------------------|-----------------------|----------------|----------------|----------------|----------------|---------------|---------------|---------------|---------------|---------------|--------------------|--------------------|----------------------|
| NORTHERN | | | | | | | | | | | | | | |
| Necanicum | 2,534 | 2,102 | 2,120 | 902 | 798 | 5,727 | 847 | 936 | 529 | 393 | 698 | -- | -- | -- |
| Nehalem | 20,159 | 19,364 | 15,322 | 2,963 | 4,539 | 30,577 | 3,079 | 7,549 | 5,486 | 4,190 | 12,383 | -- | -- | -- |
| Tillamook | 6,563 | 9,408 | 19,250 | 1,686 | 4,402 | 20,090 | 1,345 | 7,102 | 2,927 | 2,035 | 3,961 | -- | -- | -- |
| Nestucca | 7,287 | 2,063 | 7,857 | 1,751 | 946 | 6,369 | 1,029 | 2,412 | 4,495 | 1,072 | 4,602 | -- | -- | -- |
| Ind. Tribs. | 573 | 1,132 | 1,341 | 218 | 271 | 4,607 | 440 | 699 | 206 | 262 | 616 | -- | -- | -- |
| TOTAL | 37,116 | 34,068 | 45,890 | 7,520 | 10,956 | 67,370 | 6,740 | 18,698 | 13,643 | 7,952 | 22,260 | 21,480 | 42,811 | 46,692 |
| NORTH CENTRAL | | | | | | | | | | | | | | |
| Salmon | 506 | 672 | 3,636 | 297 | 1,165 | 3,680 | 332 | 1,054 | 450 | 103 | 215 | -- | 571 | 1,780 |
| Siletz | 6,902 | 11,678 | 33,094 | 4,495 | 7,660 | 19,496 | 2,216 | 3,015 | 5,202 | 4,064 | 4,509 | -- | 15,428 | 15,434 |
| Yaquina | 10,571 | 7,618 | 19,074 | 6,268 | 3,553 | 25,582 | 2,400 | 3,730 | 2,491 | 4,672 | 3,452 | -- | 16,721 | 6,477 |
| Beaver Ck. | 3,487 | 1,885 | 2,389 | 1,878 | 2,015 | 6,564 | 332 | 1,709 | 1,553 | 494 | 814 | -- | 2,483 | 1,703 |
| Alsea | 8,344 | 8,353 | 28,337 | 8,470 | 9,283 | 25,855 | 6,185 | 7,375 | 4,377 | 5,112 | 4,915 | -- | 13,633 | 18,462 |
| Siuslaw | 24,138 | 16,700 | 28,082 | 11,946 | 14,118 | 38,896 | 10,352 | 9,141 | 7,129 | 6,635 | 5,881 | -- | 38,031 | 24,578 |
| Ind. Tribs. | 3,279 | 2,017 | 4,487 | 492 | 1,929 | 1,890 | 856 | 464 | 1,646 | 958 | 289 | -- | 1,747 | 1,568 |
| TOTAL | 57,227 | 48,922 | 119,099 | 33,846 | 39,723 | 121,963 | 22,673 | 26,488 | 22,848 | 22,038 | 20,075 | 30,825 | 88,614 | 70,002 |
| SOUTH CENTRAL | | | | | | | | | | | | | | |
| Umpqua | 37,165 | 39,149 | 94,655 | 20,948 | 27,016 | 66,272 | 14,860 | 7,494 | 15,492 | 24,035 | 19,158 | 33,644 | 49,266 | 9,692 |
| Coos | 26,572 | 16,423 | 10,999 | 9,414 | 6,884 | 38,880 | 3,030 | 4,624 | 2,689 | 7,292 | 13,289 | -- | -- | 7,549 |
| Coquille | 15,571 | 19,437 | 55,667 | 5,911 | 23,637 | 41,660 | 3,357 | 9,494 | 4,641 | 5,688 | 11,841 | -- | -- | 18,970 |
| Floras Ck. | 3,568 | 3,352 | 9,217 | 2,502 | 1,936 | 1,022 | 1,585 | 942 | 693 | 628 | 904 | -- | -- | 867 |
| Sixes R. | 157 | 140 | 334 | 34 | 567 | 410 | 168 | 120 | 69 | 174 | 155 | -- | -- | 116 |
| Coastal Lakes | 18,205 | 22,557 | 20,281 | 18,922 | 13,659 | 22,010 | 4,729 | 8,044 | 1,302 | 6,704 | 7,433 | 9,722 | 19,664 | 8,075 |
| Ind. Tribs. | - | 224 | 101 | 48 | 33 | 106 | 0 | 0 | 0 | 10 | 23 | -- | -- | 0 |
| TOTAL | 101,238 | 101,282 | 191,254 | 57,779 | 73,732 | 170,360 | 27,729 | 30,718 | 24,886 | 44,531 | 52,803 | 57,627 | 114,897 | 114,897 |
| SOUTH | | | | | | | | | | | | | | |
| Rogue ^{c/} | 12,349 | 3,140 | 5,033 | 5,792 | 12,354 | 2,664 | 4,487 | 7,568 | 4,773 | 9,238 | 2,686 | 1,824 | 8,992 | 7,865 |
| COASTWIDE | 207,930 | 187,323 | 361,276 | 104,937 | 136,765 | 362,357 | 61,629 | 83,472 | 66,150 | 83,759 | 97,824 | 111,756 | 255,314 | 239,456 |

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/ (--) Estimates were not made due to low survey rates and sampling levels.

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

d/ Preliminary.

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.

| Year (t) | Recruits | | Environmental Index-Month(s) ^{a/} | | | | | | | |
|--------------------|----------|----------|--|---------|---------|---------|---------|-------|--------|---------|
| | Adults | Spawners | PDO-MJJ | UWI-JAS | UWI-SON | SSH-AMJ | SST-AMJ | SST-J | MEI-ON | SPR.TRN |
| 1970-1975 | 237.5 | 112.3 | -0.7 | 35.5 | -19.7 | -84.8 | 11.6 | 9.0 | -0.7 | 98.3 |
| 1976-1980 | 204.3 | 30.7 | -0.3 | 26.4 | -29.2 | -113.6 | 11.1 | 9.9 | -0.1 | 86.0 |
| 1981-1985 | 148.9 | 26.8 | -0.1 | 28.4 | -30.0 | -96.8 | 11.4 | 10.4 | 0.3 | 85.0 |
| 1986-1990 | 153.8 | 28.9 | 0.1 | 29.6 | -39.2 | -91.0 | 11.6 | 10.4 | 0.2 | 82.0 |
| 1991-1995 | 150.7 | 27.0 | 0.3 | 29.3 | -40.8 | -77.9 | 11.6 | 10.4 | 0.4 | 89.0 |
| 1996-2000 | 131.8 | 25.2 | 0.5 | 31.2 | -49.0 | -61.7 | 11.7 | 10.8 | 0.4 | 94.8 |
| 2000 | 156.6 | 21.5 | 0.4 | 35.8 | -26.8 | -48.2 | 11.4 | 10.2 | -0.7 | 72.0 |
| 2001 | 246.1 | 34.7 | -0.4 | 47.1 | -38.2 | -117.5 | 10.7 | 10.1 | -0.3 | 61.0 |
| 2002 | 227.3 | 61.0 | -0.6 | 50.5 | -25.9 | -139.5 | 10.1 | 11.0 | 0.8 | 80.0 |
| 2003 | 164.0 | 143.1 | -0.2 | 55.5 | -26.4 | -53.8 | 11.1 | 10.3 | 0.3 | 112.0 |
| 2004 | 146.3 | 236.4 | 0.0 | 27.0 | 4.3 | -52.4 | 11.9 | 10.2 | 0.4 | 110.0 |
| 2005 | 113.3 | 213.3 | 0.5 | 51.8 | -9.0 | -14.9 | 12.5 | 11.5 | -0.7 | 145.0 |
| 2006 | 64.9 | 154.1 | 0.8 | 53.6 | -14.1 | -25.1 | 11.2 | 9.8 | 0.8 | 112.0 |
| 2007 | 157.0 | 139.9 | 0.6 | 27.5 | -9.9 | -111.9 | 10.6 | 8.9 | -1.1 | 74.0 |
| 2008 | 262.9 | 104.7 | 0.2 | 32.7 | -10.7 | -100.9 | 9.6 | 9.4 | -1.1 | 89.0 |
| 2009 | 255.6 | 57.3 | -0.3 | 24.3 | -47.1 | -83.1 | 10.5 | 10.8 | 0.8 | 82.0 |
| 2010 | 352.4 | 156.1 | -0.5 | 34.2 | -32.9 | -35.0 | 11.7 | 10.1 | -2.1 | 100.0 |
| 2011 | 98.1 | 245.4 | -0.8 | 29.3 | -26.3 | -32.2 | 10.7 | 9.2 | -1.3 | 100.0 |
| 2012 | 130.2 | 244.7 | -0.7 | 53.6 | -29.9 | -19.9 | 11.0 | 9.9 | -0.1 | 121.0 |
| 2013 | 377.4 | 336.0 | -0.8 | 35.3 | -7.8 | -91.5 | 10.7 | 9.1 | -0.2 | 100.0 |
| 2014 | 64.6 | 80.2 | -0.4 | 41.3 | -40.1 | -14.4 | 11.2 | 12.3 | 0.2 | 101.0 |
| 2015 | 74.3 | 110.8 | 0.2 | 40.4 | -7.9 | -100.8 | 10.3 | 11.0 | 2.0 | 92.0 |
| 2017 | 67.4 | 337.7 | 1.0 | 48.0 | -68.2 | -111.5 | 11.6 | 9.9 | -0.6 | 85.0 |
| 2018 | 74.0 | 52.4 | 1.3 | 46.1 | -36.2 | -52.8 | 11.2 | 11.0 | -0.6 | 116.0 |
| 2019 | 99.2 | 67.9 | 1.0 | 41.1 | -12.4 | -107.8 | 10.8 | 11.1 | 0.3 | 107.0 |
| 2020 | 100.3 | 60.1 | 0.9 | 20.1 | 4.1 | -89.9 | 10.5 | 10.5 | 0.4 | 103.0 |
| 2021 | 251.3 | 67.8 | 0.4 | 25.6 | -18.9 | -74.7 | 11.4 | 10.3 | -1.2 | 140.0 |
| 2022 | 182.0 | 87.7 | -0.1 | 40.8 | -64.1 | -126.7 | 11.0 | 10.2 | -1.4 | 80.0 |
| 2023 ^{b/} | 226.3 | 100.2 | -0.6 | 33.8 | -6.6 | -90.3 | 11.5 | 10.6 | -1.6 | 84.0 |

a/ Environmental Index descriptions:

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

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

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

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

MEI - Multi-variate ENSO index

SPR.TRN - Spring transition date (Julian)

b/ Adult recruits is a forecasted number.

APPENDIX D

KLAMATH RIVER FALL CHINOOK ABUNDANCE FORECAST ANALYSIS

TO: Klamath River Technical Team

FROM: Michael O’Farrell, NMFS/SWFSC

DATE: January 9, 2023

SUBJECT: Klamath River fall Chinook abundance forecast analysis

At the September 14, 2022 meeting of the Klamath River Technical Team (KRTT) Doug Shaftel of Scripps Institute of Oceanography presented results of his capstone project titled Managing Uncertainty: Forecasting Ocean Abundance of Klamath River Fall-Run Chinook Salmon (*Oncorhynchus tshawytscha*). Key results of his capstone analysis were: (1) age-specific Klamath River fall Chinook (KRFC) forecasts have become increasingly inaccurate over time and, relatedly, age-specific maturation rates have increased for age-2 through age-4 KRFC over time. To address the forecast inaccuracy issue, two alternative forecasting approaches were proposed. Model 1 used data from brood years 1990-forward to inform the age-specific sibling regression abundance forecast. Model 2 used a moving window of the ten most recent brood years to inform the age-specific sibling regression abundance forecast. Forecast accuracy was then evaluated for Model 1, Model 2, and the status quo data range. Increased accuracy was observed for age-3 and age-4 forecasts under both Model 1 and Model 2, with larger increase in accuracy for Model 2. The takeaway messages from this analysis were (paraphrased):

1. KRFC are returning to the river earlier in life,
2. The shift toward earlier maturation happened abruptly,
3. Removing data for older broods increased forecast accuracy, and
4. Using the 10 most recent brood years for forecasting may be able to respond to future changes in maturation rates.

To provide some more information on abundance forecast performance I repeated aspects of the Shaftel analysis. I limited the evaluation to forecasts from management years 2012-2021 and considered alternative forecast performance measures. A one-step-ahead cross-validation approach was employed; forecasts were made based on the data available at the time (as would be done in practice), and the forecasts were compared to postseason estimates of abundance. Age-specific forecasts were made for management years 2012-2021 under three scenarios: (1) status quo data range, (2) 1990-forward, and (3) the 10 most recent brood years.

Abundance forecast performance was evaluated for the three data range scenarios using Mean Accuracy (MA), Mean Raw Error (MRE), and Median Log Accuracy Ratio (MLAR). Mean Accuracy was defined in Shaftel (2022) as

$$MA = \frac{1}{n} \sum_{y=1}^n \frac{N_{pre,y}}{N_{post,y}}$$

where $N_{pre,y}$ and $N_{post,y}$ are year y forecast abundance and postseason-estimated abundance, respectively, and n is the total number of pre:post comparisons. MA values that exceed 1.0 indicate that the forecasts, on average, exceeded the postseason estimates and MA values less than 1.0 indicate that the forecasts, on average, were lower than the postseason estimates.

Mean percent error is defined as

$$MPE = \frac{1}{n} \sum_{y=1}^n \frac{N_{pre,y} - N_{post,y}}{N_{post,y}}$$

MPE is also useful for assessing whether forecasts are biased, on average. Positive values of MPE indicate mean over-forecasting, while negative values of MPE indicate mean under-forecasting. The median log accuracy ratio was also considered.

$$MLAR = \text{median} \left[\log \left(\frac{N_{pre}}{N_{post}} \right) \right]$$

Where again, positive values of MLAR indicate overforecasting and negative values indicate underforecasting.

The performance of abundance forecast for age-3, age-4, and total abundance under the three forecast alternatives was compared using MA, MPE, and MLAR. Results for the MA performance measure are found in Table 1. Table 2 displays results for the MPE performance measure and Table 3 displays results for the MLAR performance measure.

Table 1. Mean Accuracy results for the three forecast scenarios.

| Forecast | Mean Accuracy | | |
|---------------|---------------|-------|--------------|
| | Age-3 | Age-4 | Total adults |
| Status quo | 1.62 | 2.04 | 1.60 |
| 1990-forward | 1.45 | 1.63 | 1.40 |
| 10-yr running | 1.20 | 1.57 | 1.20 |

Table 2. Mean Percent Error results for the three forecast scenarios.

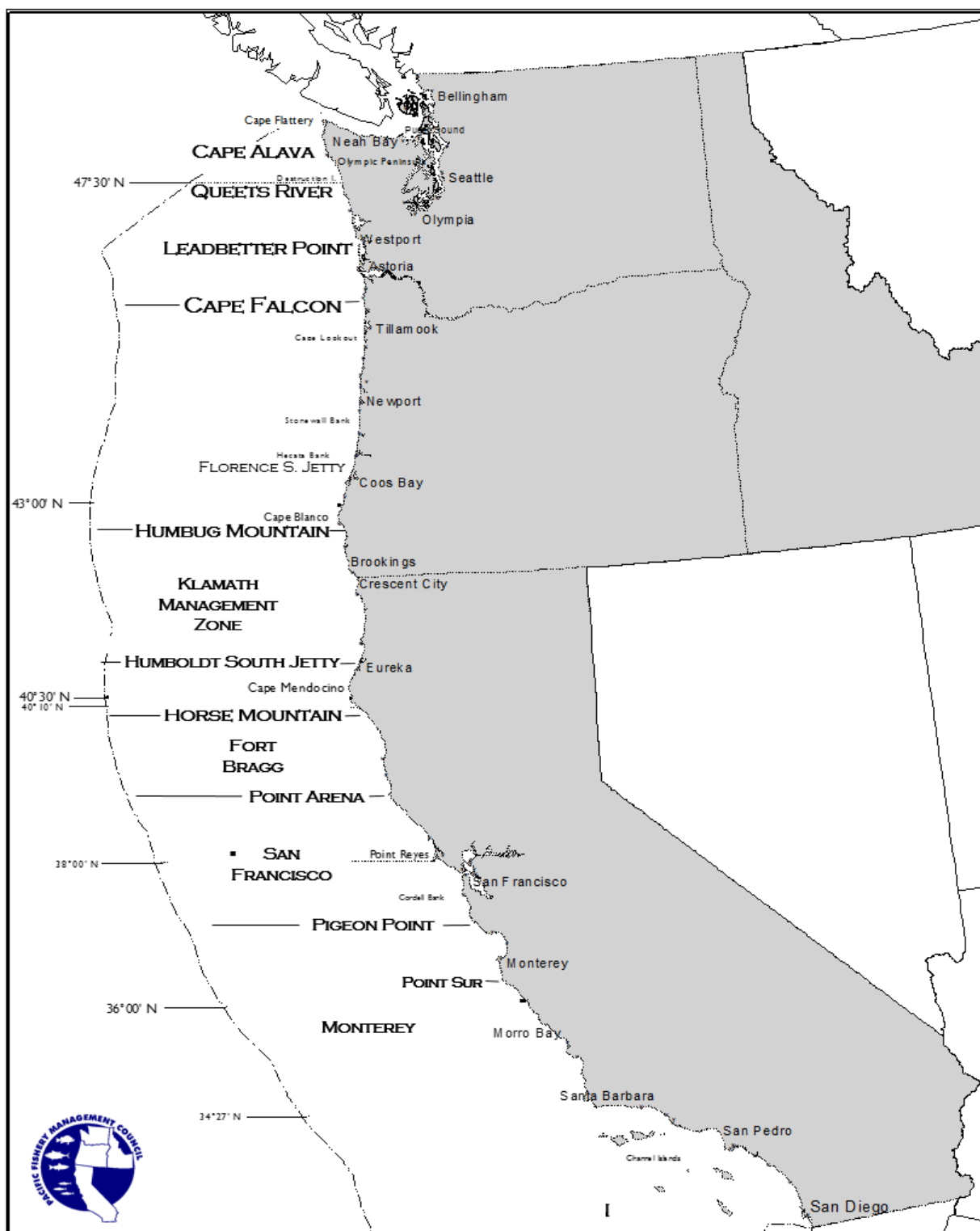
| Forecast | Mean Percent Error | | |
|---------------|--------------------|-------|--------------|
| | Age-3 | Age-4 | Total adults |
| Status quo | 0.62 | 1.04 | 0.60 |
| 1990-forward | 0.45 | 0.63 | 0.40 |
| 10-yr running | 0.20 | 0.57 | 0.20 |

Table 3. Median Log Accuracy Ratio results for the three forecast scenarios.

| Forecast | Median Log Accuracy Ratio | | |
|---------------|---------------------------|-------|--------------|
| | Age-3 | Age-4 | Total adults |
| Status quo | 0.33 | 0.35 | 0.40 |
| 1990-forward | 0.16 | 0.10 | 0.23 |
| 10-yr running | -0.02 | 0.12 | 0.12 |

The results for the MA and MPE performance measures indicated that the best forecast performance for age-3, age-4, and total adult KRFC occurred when forecasts were made using a 10-year window of data. A similar conclusion could be made when considering the MLAR performance measure. For MLAR the age-3 and total adult forecast performance was highest for the 10-year running forecast alternative. For the age-4 forecast, the 1990-forward alternative had slightly better performance than the 10-year running alternative.

At the September 14, 2022 KRTT meeting, there was some discussion about whether changes to the KRFC abundance forecasting approach should be implemented prior to the planning of 2023 fisheries. The work described here validated the results presented by Doug Shaftel. I propose that time should be provided at our January 24-27, 2022 KRTT meeting to discuss this topic once again, with the goal of resolving the issue.



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