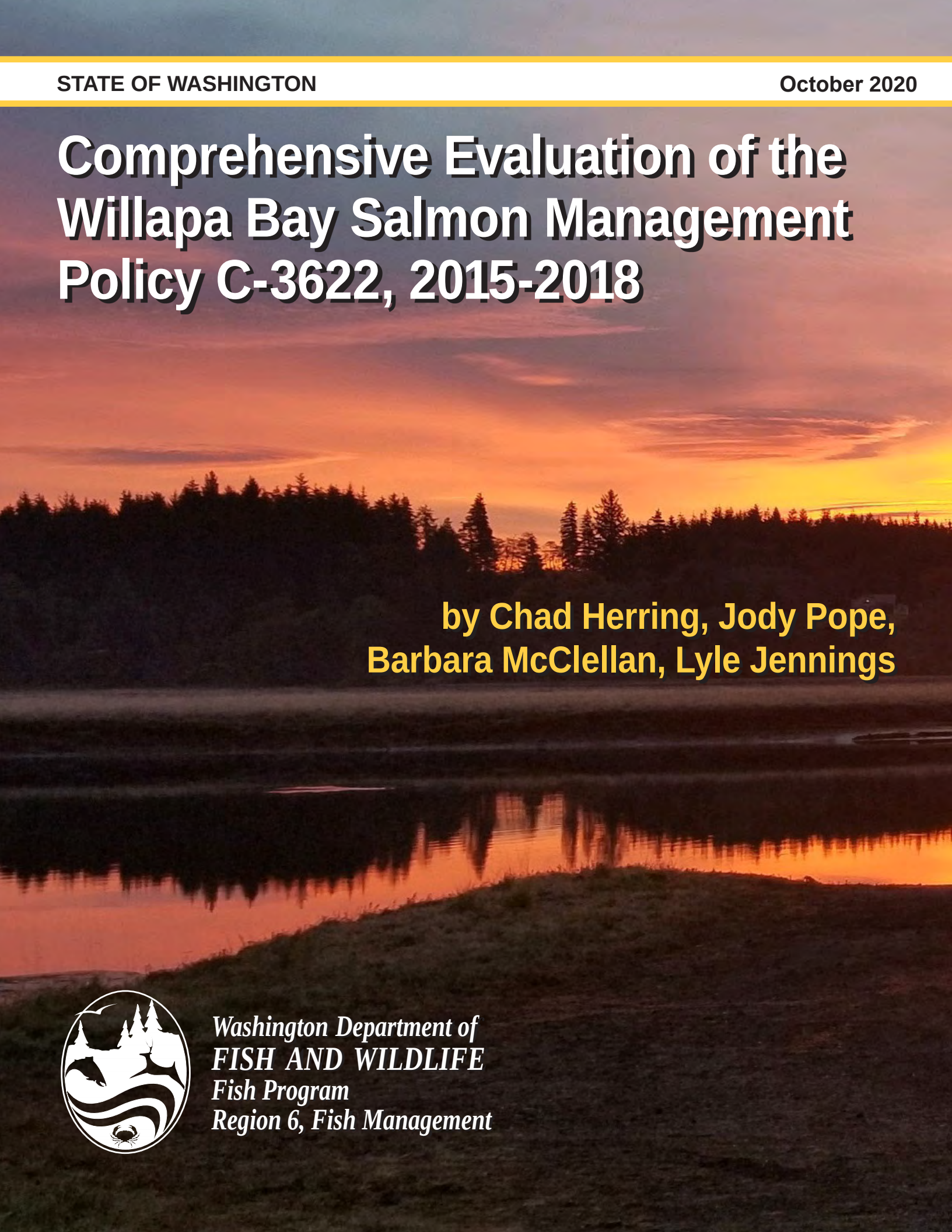
STATE OF WASHINGTON October 2020

Comprehensive Evaluation of the Willapa Bay Salmon Management Policy C-3622, 2015-2018

by Chad Herring, Jody Pope,
Barbara McClellan, Lyle Jennings



Washington Department of
FISH AND WILDLIFE
Fish Program
Region 6, Fish Management

Comprehensive Evaluation of the Willapa Bay Salmon Management Policy C-3622, 2015-2018

By: Chad Herring, Jody Pope, Barbara McClellan, Lyle Jennings

Washington Department Fish and Wildlife, Region 6, Fisheries Staff

Table of Contents:

List of Tables iv

List of Figures vii

1.0 Executive Summary 1
- 1.1 General Fisheries Management 1
- 1.2 Fall Chinook Salmon Management 2
- 1.3 Coho Management 2
- 1.4 Chum Management 3
- 1.5 Adaptive Management 3
- 1.6 Economic Analysis 4
- 1.7 Conclusions 4

2.0 Purpose and Approach 5
- 2.1 Purpose 5
- 2.2 Background 6
- 2.3 Task 8
- 2.4 Approach 8
- 2.5 Policy Implementation Report Card 9

3.0 Policy C-3622 with Evaluation Emphasis Questions 10

4.0 General Fisheries Management 21
- 4.1 Conservation and Restoration of Wild Salmon 22
  - 4.1.1. Commissioner's Emphasis Question #1: 27
  - 4.1.2 Commissioner's Emphasis Question #2: 28
  - 4.1.3 Commissioner's Emphasis Question #3: 29
- 4.2 Monitoring, Sampling, and Enforcement Programs 31
- 4.3 Improved Fishery Management and Technical Tools 33
  - 4.3.1 Commissioner's Emphasis Question #14: 34
- 4.4 Mark-Selective Fisheries (MSF) 34
  - 4.4.1 Commissioner's Emphasis Question #9: 34
  - 4.4.2 Commissioner's Emphasis Question #15: 35
- 4.5 Investigate and Promote Alternative Gear 35
  - 4.5.1 Commissioner's Emphasis Question #20: 36
  - 4.5.2 Commissioner's Emphasis Question #24: 36
- 4.6 In-Season Management Actions 36
- 4.7 Transparency of Salmon Management 39
- 4.8 Implement Improved Broodstock Management 40
  - 4.8.1 Commissioner's Emphasis Question #11: 41
  - 4.8.2 Commissioner's Emphasis Question #12: 42
- 4.9 Protect and Restore Habitat Productivity 42
  - 4.9.1 Commissioner's Emphasis Question #10: 46
- 4.10 Work with PSC and PFMC 46

5.0 Fall Chinook Salmon 48
- 5.1 Broodstock Management Objectives 49
  - 5.1.2 Commissioner's Emphasis Question #18: 52

5.1.3 Commissioner's Emphasis Question #19: 52
5.2 Fishery Management Objectives 53
5.2.1 Commissioner's Emphasis Question #7: 56
5.2.2 Commissioner's Emphasis Question #22: 56
5.2.3 Commissioner's Emphasis Question #23: 56
5.3 Recreational Fisheries 57
5.3.1 Commissioner's Emphasis Question #6: 59
5.3.2 Commissioner's Emphasis Question #16: 59
5.3.3 Commissioner's Emphasis Question #21: 60
5.4 Commercial Fisheries 60
5.5 Hatchery Production 62
5.5.1 Commissioner's Emphasis Question #27: 63
5.6 Stock Assessment 64
5.6.1 Commissioner's Emphasis Question #17: 67
6.0 Coho Management 68
6.1 Broodstock Management Objectives 70
6.1.1 Commissioner's Emphasis Question 28: 71
6.2 Fishery Management Objectives 72
6.2.1. Commissioner's Emphasis Question #29: 73
6.3 Recreational Fisheries 74
6.3.1 Question #30: 75
6.4 Commercial Fisheries 76
6.5 Hatchery Production 76
6.6 Stock Assessment 78
7.0 Chum Management 80
7.1 Broodstock Management 81
7.1.1 Commissioner's Emphasis Question #31: 81
7.2 Fishery Management Objectives 81
7.2.1 Commissioner's Emphasis Question #32: 83
7.2.2 Commissioner's Emphasis Question #33: 83
7.3 Recreational Fisheries 84
7.4 Commercial Fisheries 85
7.6 Stock Assessment 87
8.0 Adaptive Management 88
8.1 Conduct Annual Fishery Management Review 88
8.1.1 Commissioner's Emphasis Question #8: 88
8.1.2 Commissioner's Emphasis Question #25: 89
8.1.3 Commissioner's Emphasis Question #26: 89
8.2 Evaluation of Fishery Management Tools 90
8.3 Improve In-season Management 90
8.4 Review Spawner Goals 90
8.5 Comprehensive Hatchery Assessment 91
8.5.1 Commissioner's Emphasis Question #35: 93
8.6 Ocean Ranching Report 93
8.6.1 Commissioner's Emphasis Question #36: 93

9.0 Economic Analysis 94
9.1 Recreational Fisheries 94
9.1.1 Commissioner's Emphasis Question #5: 94
9.2 Commercial Fisheries 96
9.2.1 Commissioner's Emphasis Question #4: 98
Acknowledgments 100
References 101
Appendix 1. Willapa Bay Chinook Spawner-Recruit Assessment Overview 102
Appendix 2. 2015-2018 Annual Willapa Bay Fishery Management Presentations 112
Appendix 3. Status Determination Criteria for Willapa Bay Natural Coho 155
Appendix 4. Willapa Bay Hatchery Assessment Presentation 165
Appendix 5. Ocean Ranching Presentation 174
Appendix 6. Willapa Bay Salmon Advisory Group Meetings 183

List of Tables

Table 1. Report card for the comprehensive review of the Willapa Bay Salmon Management Policy C-3622 9

Table 2. Pre-season prediction of management objectives for years 2015-2018..... 24

Table 3. Estimated post-season aggregate Willapa Bay salmon impact rates. Rates for Chinook salmon and coho are for natural-origin fish..... 27

Table 4. Estimated post-season aggregate spawning escapements for Willapa Bay salmon from 2011-2018 28

Table 5. Geometric mean of spawning escapements estimates for natural populations of Chinook within the Southwest Washington ESU from 1995 to 2018 29

Table 6. Geometric mean of estimates of spawning escapements for natural populations of coho within the Southwest Washington ESU from 1995 to 2018 30

Table 7. Geometric mean of estimates of spawning escapements for natural populations of chum within the Southwest Washington ESU from 1995 to 2018 30

Table 8. The number of interviews and anglers sampled from Willapa Bay Recreational Marine Area 2.1 monitoring program from 2015-2018..... 31

Table 9. The number of total commercial landings and on-board observations conducted within Willapa Bay from 2014-2018 33

Table 10. Mark-selective commercial fishing gear set aside by fishery (2015-2018)..... 35

Table 11. The predicted and actual estimates of Willapa River and Naselle River natural-origin Chinook salmon impacts accrued in commercial fisheries by fishery (2015-2017)... 36

Table 12. In-season management actions 2015-2018 37

Table 13. Willapa Bay Natural Origin Spawner (NOS) Escapement Estimates (2015-2018) ... 39

Table 14. Estimates of pHOS, pNOB, and PNI for Chinook salmon in the Willapa and Naselle River and pHOS in the North Nemah River from 2011-2018 51

Table 15. Commercial fishery mark-selective gear set-aside proportions by fishing year, 2015-2018 54

Table 16. Evaluation of pre-season prediction and post-season estimate of impact rates on natural-origin Chinook salmon resulting from fisheries prosecution in 2015-2018... 55

Table 17. Estimates of the aggregate natural origin impact rates on Willapa Bay Chinook salmon from 2011-2018..... 57

Table 18. The preseason predicted estimates of impact rates to natural origin Chinook salmon from marine area 2.1 (MA 2.1) and freshwater (FW) fisheries from 2015 to 2018 ... 58

Table 19. The postseason estimates of impact rates to natural origin Chinook salmon from marine area 2.1 (MA 2.1) and freshwater (FW) fisheries from 2015 to 2018..... 58

Table 20. The preseason predicted and postseason estimates of landed harvest of Chinook salmon from marine area 2.1 and freshwater fisheries from 2015 to 2018 59
Table 21. Estimates of angler trips and landed catch of Chinook salmon in Willapa Bay recreational fisheries from 2011 to 2018 59
Table 22. Post-season estimated impact rates on natural origin Chinook salmon during recreational fisheries from 2011 to 2018 60
Table 23. The preseason predicted and postseason estimates of natural origin Chinook salmon impact rates from commercial fisheries in Willapa Bay from 2015 to 2018..... 61
Table 24. The preseason predicted and postseason landed catch of Chinook salmon in Willapa Bay commercial fisheries from 2015 to 2018..... 62
Table 25. Fall Chinook salmon hatchery production goals beginning with the 2020 brood year 63
Table 26. Fall Chinook salmon smolt releases by brood year from Willapa Bay Hatchery facilities 2011-2018 64
Table 27. Actual Chinook salmon spawning ground survey mileage pre policy (2011-2014) and during policy (2015-2018) 64
Table 28. Chinook salmon spawning escapements from the Primary and Contributing stock populations from 2011-2018..... 65
Table 29. Chinook salmon spawning escapements from Bear, Palix, and Nemah River basins from 2011-2018 67
Table 30. Estimates of pHOS, pNOB, and PNI for Coho in the Willapa and Naselle Rivers from 2011-2018 71
Table 31. Coho preseason expected escapement and postseason escapement estimates resulting from recreational and commercial fisheries from 2015 to 2018..... 73
Table 32. Total coho smolts (late and normal combined) released from Willapa Bay Hatchery facilities from 2011 to 2018..... 77
Table 33. Willapa Bay coho cooperative (CoOp) and remote stream incubation (RSI) programs 78
Table 34. The preseason prediction and post season estimate of the proportional total impacts to Willapa Bay chum resulting from recreational and commercial fisheries from 2015 to 2018..... 83
Table 35. The estimated landed catch of Willapa Bay chum in recreational fisheries in marine area 2-1 and freshwater from 2015 to 2018 85
Table 36. Comparison of chum spawning escapement methods utilizing three stream index sites versus ten stream index sites for the years 1996, 2004, and 2018 87
Table 37. Estimated number of angler trips and economic benefit in Willapa Bay marine area 2-1 from 2015 to 2018..... 94
Table 38. The observed catch per unit effort (CPUE) of recreational fisheries from marine area 2-1 recreational monitoring programs in Willapa Bay from 2015-2018 95

Table 39. The estimated number of angler trips in marine area 2-1 prosecuted in Willapa Bay from 2011 to 2018 95
Table 40. Ex-vessel value of commercial fisheries prosecuted in Willapa Bay by species from 2011 to 2018 97
Table 41. The estimated total economic benefit of commercial fisheries prosecuted in Willapa Bay from 2011 to 2018 98
Table 42. Ex-vessel value of salmon in Willapa Bay commercial fisheries normalized by price per pound and by run size from 2011 to 2018 99

List of Figures

Figure 1. Map of Willapa Bay watershed including commercial catch areas, hatchery facilities, and major streams 6

Figure 2. Willapa Bay Chinook salmon natural origin spawner escapement from 1980 to 2014 (estimated) 22

Figure 3. Willapa Bay coho natural origin spawner escapements from 1996 to 2014 (estimated) 23

Figure 4. Willapa Bay chum spawner escapement from 1980 to 2014 (estimated) 23

Figure 5. Willapa Bay commercial catch areas 25

Figure 6. Estimated Willapa Bay natural origin Chinook salmon spawner escapement from 2000-2018 26

Figure 7. Estimated Willapa Bay natural origin coho spawner escapement from 1996-2018 . 26

Figure 8. Estimated Willapa Bay chum spawner escapement from 2000-2018 27

Figure 9. Fish passage barriers in Willapa Bay 43

Figure 10. Restoration projects in Willapa Bay (2015-2018) 44

Figure 11. Denny Creek Vicinity Map 45

Figure 12. Denny creek redd trends pre policy (blue lines) and during policy (orange lines) ... 45

Figure 13. Historical Chinook salmon total run size and hatchery production from 1969 to 2018 48

Figure 14. Willapa Bay Chinook salmon historical exploitation rates from all marine area fisheries based on post season FRAM modeling from 1992 to 2016 49

Figure 15. The total landed catch of Chinook salmon in Willapa Bay fisheries by recreational sector (blue lines) and commercial sector (orange lines) from 1991-2018 56

Figure 16. The landed catch of Chinook salmon by recreational fishing area from 2011-2018 57

Figure 17. The total landed catch of Chinook salmon from commercial fisheries in Willapa Bay pre-policy (blue lines) and during policy (orange lines) 61

Figure 18. Historic hatchery production of fall Chinook salmon from Willapa Bay Facilities from brood year 1978 to 2018 63

Figure 19. Historic Willapa Bay coho total terminal abundances pre policy (blue lines) and during policy (orange lines) 68

Figure 20. The proportional coho post season mortality rate estimates for unmarked and marked fish generated from FRAM models for 1984 to 2018 69

Figure 21. Estimates of Willapa Bay coho spawning escapement pre-policy (blue lines) and policy implementation (orange lines) 73

Figure 22. Willapa Bay recreational marine and freshwater coho harvest from 2011 to 2018 74
Figure 23. Coho recreational freshwater harvest throughout the six major systems (2011-2018) 75
Figure 24. Total landed coho harvest in Willapa Bay commercial fisheries pre policy (blue lines) and during policy (orange lines) 76
Figure 25. Coho smolts released (late and normal timed) from Forks Creek and Naselle Hatcheries from 2011-2018 78
Figure 26. Willapa Bay coho NOS and HOS escapements from 2011-2018 79
Figure 27. Willapa Bay chum total terminal abundances pre-policy (blue bars) and policy implementation years (orange bars) 80
Figure 28. Estimates of Willapa Bay chum spawning escapement pre policy (blue lines) and during policy (orange lines) 82
Figure 29. The estimated historical landed catch of chum in recreational fisheries by fishery sector from 1996 to 2008 84
Figure 30. The total landed catch of chum salmon in Willapa Bay commercial fisheries pre policy (blue lines) and during policy (orange bars) 85
Figure 31. The total number of chum salmon released from Willapa Bay Hatchery facilities, including cooperative programs, from 1968 to 2018 86
Figure 32. Total ex-vessel value of commercial fisheries prosecuted in Willapa Bay from 2009 to 2018 96
Figure 33. Total number of individual fishers (with landings) participating in Willapa Bay commercial fisheries from 2000 to 2018 98

1.0 Executive Summary

The Willapa Bay Salmon Management Policy (C-3622) was adopted by the Fish and Wildlife Commission (FWC and/or Commission) in June of 2015. The adaptive management section of Policy C-3622 directed staff to provide a comprehensive review on the implementation and performance of the Policy upon the completion of transition period (e.g. 2019), referred to as phase one (e.g. 2015 to 2018). The review will focus on whether the provisions of the Policy were implemented and whether the stated purpose and objectives of the Policy were successfully achieved in phase one.

The intent of this review is to assist the Commission in their evaluation of a) whether the Policy was successful in achieving the stated objectives, principles, and provisions; b) areas where the Policy failed or has not been working well, and c) to provide information that might help explain reasons why certain expected outcomes may not have occurred. The intent can be abbreviated as follows: Has the Policy been implemented as written, and what has occurred as a result of Policy changes?

The analytical approach was to provide information and analysis on each of the sections of the Policy. The purpose and guiding principles will be covered in the section titled General Fisheries Management, while species-specific guidance and adaptive management provisions of the Policy will be covered in the corresponding sections of this report: Fall Chinook salmon Management, Coho Management, Chum Management, and Adaptive Management. The final section of the report will cover the economics of the fishing industry, recreational and commercial, within Willapa Bay.

1.1 General Fisheries Management

This section of the report will focus on discussion of the purpose and objectives as well as the eleven guiding principles that are described in Policy C-3622. Themes in this section of the report include; work with partners to improve salmonid habitat and productivity, work with Pacific Fishery Management Council (PFMC) and Pacific Salmon Commission (PSC) to promote conservation of Willapa Bay salmon stocks, implementation of improved broodstock management as it relates to hatchery reform and Commission Policy C-3619, improve fishery monitoring programs, improve fishery management through evaluation and development of technical tools, implement in-season adaptive management, and improve communication, documentation, and transparency of catch accounting and fishery management actions.

Coordination and collaboration increased between the Habitat program and fishery management staff. This has resulted in opening additional spawning habitat that had been previously blocked. Also, there was collaboration on grant proposals to better focus habitat restoration activities and understand salmonid productivity in Willapa Bay.

Coinciding with policy implementation, additional funding was secured to increase monitoring efforts of recreational and commercial fisheries in marine areas as well as to expand spawning ground survey coverage. These additional monitoring programs have led to improved and more timely data which has enabled adaptive management of fisheries in-season. Also, these additional data have led to improvements in forecasting and fishery planning tools. Fisheries have been planned pre-season to meet objectives consistent with the PFMC and PSC processes and federal court orders.

Lastly, Department staff have increased data sharing and transparency of fishery management actions by development of the Willapa Bay Salmon Advisory Group (WBSAG) webpage on the Agency website and teleconferences with WBSAG when necessary. Specifically, staff have increased the communication of catch accounting and fishery management actions by developing a weekly mailer to Willapa Bay salmon

advisors and other interested members of the public. The weekly mailer is shared electronically during the fishery season and summarizes catch and effort estimates relative to pre-season predictions to support management and conservation objectives.

1.2 Fall Chinook Salmon Management

This section of the document will provide evaluation of the implementation and performance of species-specific guidance for fall Chinook salmon in Policy C-3622 on broodstock management, fishery management objectives, recreational and commercial fisheries, hatchery production, and stock assessment.

Policy development was heavily focused on the restoration and conservation of natural origin fall Chinook salmon stocks within Willapa Bay. This was due to the failure to consistently meet escapement objectives, lack of implementation of hatchery reform principles, and frustration in the historic allocation of fall Chinook salmon between fishery sectors.

A two phased approach was utilized in policy implementation to promote conservation and restoration of Willapa Bay Chinook salmon. Phase one encompassed years 2015-2018 and phase two would begin in 2019 and runs through the end of the Policy. The current policy is set to expire in 2023. Fisheries would be managed as mark selective to promote harvest of abundant hatchery fish while minimizing impact to natural origin Chinook salmon. In phase one, the harvest of Chinook salmon would be planned to limit fisheries to an impact rate cap of 20% on natural origin Willapa River and Naselle River Chinook salmon stocks. Time and area restrictions for prosecution of commercial fisheries would be employed to limit their impact on Chinook salmon stocks and harvest of Chinook salmon would be prioritized for recreational fishers.

Preseason fisheries were planned to meet the objectives outlined in the Policy, but post season estimates in the initial years exceeded the impact rate caps. The average natural origin spawning escapement across all stock in Willapa Bay has increased slightly in the four years of policy implementation in comparison to the four years preceding the Policy. The majority of that increase has been documented in the Willapa River basin, which has exceeded its escapement goal in 2017 and 2018. The use of time and area closures for commercial fisheries along with increased bag limits in the sport fishery has shifted the harvest allocation proportions of Chinook salmon to recreational fishers. Recreational fisheries averaged 33% of the total harvest of Chinook salmon from 2011 to 2015 and 77% of the total Chinook salmon harvested in phase one of the Policy, years 2015 to 2018.

1.3 Coho Management

This section of the document will provide evaluation of the implementation and performance of species-specific guidance for fall coho in Policy C-3622 on broodstock management, fishery management objectives, recreational and commercial fisheries, hatchery production, and stock assessment.

The abundance of Willapa Bay coho have historically exceeded escapement objectives and provided for robust fishery opportunities. Policy development of management objectives for Willapa Bay coho focused on continued implementation of hatchery reform principles and objectives, and the maintenance of historic escapement objectives. The harvest of coho was prioritized for commercial fisheries with any remaining available impacts to be utilized by recreational fisheries.

For the years 2015 to 2018, salmon fisheries in Willapa Bay were planned such that the predicted natural origin escapement would exceed the goal of 13,600 fish. For the same time frame, post season estimates of natural origin coho spawners fell short of the escapement goal in three out of the four years. This was

due partially by over forecasting of the terminal run size for Willapa Bay coho preseason. This situation was not unique to Willapa Bay as poor ocean conditions led to a decline in the abundance of coho stocks across the North Pacific and poor forecast performance. On average, during phase one, commercial fisheries harvested a greater number of coho than that of recreational fishers. The lack of abundant coho to harvest in Willapa Bay has resulted in decreased ex-vessel value for commercial fisheries compared to pre-policy years and may have influenced decreased participation.

1.4 Chum Management

This section of the document will provide evaluation of the implementation and performance of species-specific guidance for fall chum in Policy C-3622 on broodstock management, fishery management objectives, recreational and commercial fisheries, hatchery production, and stock assessment.

Similar to Willapa Bay fall Chinook salmon stocks, Willapa Bay chum failed to reach established spawning escapement goals consistently in recent years. Therefore, management objectives for prosecution of fisheries were more constrained for chum harvest to provide for increased conservation of this stock. Commonly referred to as "the penalty box", fisheries for chum were constrained to an impact of no more than 10% when escapement goals had not been met consecutively for two years and in three out of the last five years. Also, commercial fisheries could not be prosecuted during the chum management period, October 15 through October 31, if the above condition had not been met. Lastly, the harvest of chum was prioritized for commercial fishing opportunity with any remaining available impacts to be utilized by the recreational sector.

From 2015 to 2018, fisheries in Willapa Bay were planned such that they would result in an impact of no more than 10% of chum salmon. This was due to the lack of meeting escapement objectives for two consecutive years and in three out of the last five years. Also, commercial fisheries were not planned to occur during the October 15 through October 31 time frame. Fishery managers utilized a variety of different fishery paradigms during phase one, (e.g. legal to be retained or requiring release of encountered chum) to utilize the available chum impacts to focus commercial harvest on coho. Post season estimates of the total spawning escapement of chum exceeded the escapement objective of 35,400 three out of the four years of policy implementation. Post season estimates of the impact of terminal fishery prosecution (recreational and commercial), showed an impact of less than 10% of the management objective, with an average of 5.6% from 2015 to 2018.

1.5 Adaptive Management

This section of the report will focus on deliverables outlined in the adaptive management section of the Policy. The deliverables include annual fishery reviews on the implementation and performance of policy guidance. Guidance was also provided to improve the use of in-season management to reach policy objectives and to review the spawner escapement objectives to ensure they meet current productivity. Lastly, the document will cover reports from staff to the Commission on the opportunities and constraints to hatchery production within Willapa Bay and concerning ocean ranching.

Beginning in February of 2016 and continuing annually in the month of February, Agency staff provided a preliminary briefing on the outcome of annual fishing plans and fishery management actions in relation to guidance and objectives in Policy C-3622. A copy of all the annual briefing presentations is available in Appendix 2. Section 4.2 and 4.3 will cover the technical improvement of fishery management tools that were developed then utilized to meet policy objectives in-season. These improvements include increased monitoring and sampling of commercial and recreational fisheries as well as increased surveying efforts focused on spawning ground estimation for salmon within Willapa Bay. These more robust fisheries

management tools allowed for comparison of actual in-season estimates versus pre-season predicted values associated with fishery prosecution to allow for evaluation of attainment of fishery management objectives. This resulted in in-season adaptive management changes to preseason fishery plans to ensure fishery management objectives were met from 2015 to 2018. These adaptive management actions are discussed in more detail in section 4.6. Both staff briefings to the Commission on hatchery production and ocean ranching were held in 2016 and 2017, respectively. Copies of those presentations can be found in Appendix 4 and 5 respectively.

1.6 Economic Analysis

This section of the document will review the economics associated with recreational and commercial fisheries in Willapa Bay. Pre-policy, there were limited data associated with recreational fisheries in Willapa Bay in which to provide for a full economic analysis of the impacts of policy implementation. The development of recreational monitoring programs for marine area fisheries does allow for reporting on the economic benefit of those fisheries. Recreational freshwater fisheries monitoring only allows for estimates of total fish landed which prevents robust estimates of economic benefit associated with these fisheries.

Longer term robust monitoring programs as well as total harvest and effort estimates for commercial fisheries provides for comparative analysis of economic benefit. The time and area restriction on prosecution of commercial fisheries targeting Chinook salmon have had a negative effect on commercial fishery ex-vessel values and corresponding economic benefit. While coho and chum stocks were prioritized for commercial harvest, the decline in terminal coho abundance has resulted in even further decline in revenue for commercial fishers. Chum stocks, while showing some improvement relative to escapement goals, have also not provided for any additional commercial fishing opportunity. Overall, ex-vessel values for the commercial fishery are down dramatically from pre-policy levels.

1.7 Conclusions

The intent of the Willapa Bay Salmon Management Policy C-3622 was to provide fishery managers with general guidance and management objectives for salmon management in Willapa Bay. The purpose of Policy C-3622 as stated is to achieve restoration of wild salmon and avoid ESA designation of any salmonid species within Willapa Bay. Within these conservation principles, the policy seeks to maintain or enhance the economic well-being and stability of the fishing industry, both recreational and commercial, through an appropriate distribution of fishing opportunities. Lastly, the Policy provides guidance to enhance transparency and information sharing with the public of salmon management in Willapa Bay along with improving the technical rigor of fishery management tools. These actions in total were meant to restore and maintain public trust and support of salmon management in Willapa Bay. To date, the implementation of Policy C-3622 has resulted in limited improvement in achieving the conservation objectives, expressed in terms of spawning escapement goals, but has failed to maintain economic viability of salmon fisheries within Willapa Bay and has not resulted in improved public trust and support for the Department's management of Willapa Bay salmon fisheries.

The implementation and performance of Policy C-3622 has produced mixed results. Pre-season fisheries planning has been shaped to meet outlined objectives in the Policy, and the Department has increased fisheries monitoring and the technical rigor of fishery management tools. The Department has taken steps to increase the transparency and information sharing with the public. Natural origin spawning escapements for Chinook salmon and chum have shown improvement over pre-policy levels. However, total terminal abundances of coho stocks have been severely depressed likely resulting from poor ocean conditions.

The commercial fishery has seen a dramatic reduction in catch and corresponding declines in ex-vessel value. This has contributed to a significant drop in effort. This trend has been exacerbated by the recent poor returns of coho as well as limitations to chum harvest (i.e. 10% impact rate cap). Also, the reduction in impact rate cap to 20% for wild Chinook salmon and returns from decreased hatchery Chinook salmon production will further limit commercial fishery opportunity and harvest in the coming years.

The effect on recreational fishing from the Policy's implementation has been less severe in phase one. The removal of commercial fishing opportunity in August, more robust bag limits, opening of historically closed freshwater areas, and implementation of the impact rate caps has resulted in increased harvest allocation proportion for recreational fisheries for Chinook salmon and coho. Changes in the hatchery production paradigm, both in numbers of fish released as well as location, will negatively impact marine recreational fisheries in future years. The management actions resulting from policy implementation has led to enforcement challenges in terms of disorderly fisheries in some freshwater areas.

2.0 Purpose and Approach

2.1 Purpose

The purpose of this report is to respond to the Commission assignment for a comprehensive review of the Willapa Bay Salmon Management Policy C-3622 from 2015-2018. Under the Adaptive Management section, the Policy calls for "…annual reviews beginning in 2016 and a comprehensive review at the end of the transition period (e.g. 2019)." It is not the purpose of this report to identify new areas for adjustments or adaptive changes to Policy C-3622, nor to evaluate any options for changes. It is solely to provide information to the Commissioners to help in their evaluation of whether the Policy; a) has been successful in achieving the stated objectives, principles, and provisions; b) areas where the Policy has failed or has not been working well, and c) provides information that might help explain reasons why these potential outcomes may have occurred.

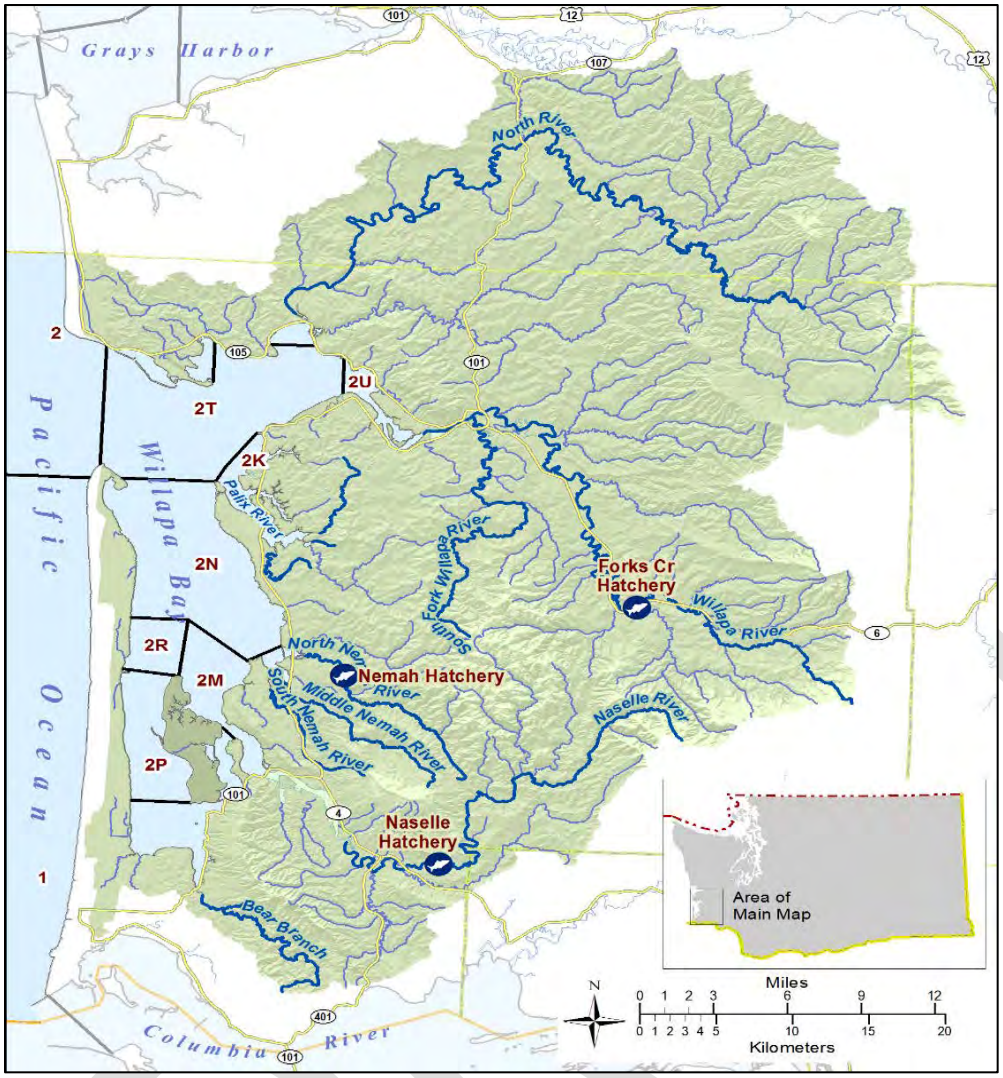


Figure 1. Map of Willapa Bay watershed including commercial catch areas, hatchery facilities, and major streams.

2.2 Background

Willapa Bay has a long history of hatchery production of salmonids with the first releases occurring in the late 1800's. Production consisted of mostly Chinook salmon, coho, and chum. Out of basin stocks were used to supplement broodstock throughout the mid-20th century. These stocks were brought in from Grays Harbor, North Coastal, and Puget Sound. Peak hatchery production for Chinook salmon occurred in the 1990's, reaching releases of 10 to 12 million. For coho and chum, peak production occurred in the 1980's with releases of three to five million and five to nine million, respectively. A map of Willapa Bay including hatchery facilities and commercial catch areas are represented in Figure 1.

Commercial fisheries have a long history in Willapa Bay. The primary gear type utilized were fish traps until they were outlawed in 1935. Gill nets have been the primary gear type for commercial fisheries since. Historically, all three naturally occurring salmon stocks were targeted. Willapa Bay has provided

robust recreational opportunity in both marine and freshwater areas, primarily targeting Chinook salmon and coho.

Historically, there have been many challenges associated with salmon management in Willapa Bay. They include but are not limited to stock composition of harvest in the marine area fisheries, origin composition both in fisheries and on the spawning grounds, the lack of consistently reaching escapement and management objectives, and lack of adequate hatchery infrastructure to remove hatchery fish that escape fisheries. Marine area fisheries impact both local and non-local stocks with wide ranging variability annually. The ability to visually identify hatchery vs. naturally produced salmon has been a more recent development with hatchery produced Chinook salmon and coho being mass marked beginning in the 2006 brood year and 1996 brood year, respectively. Currently, the Department lacks the ability to mass mark hatchery produced chum in Willapa Bay. While coho have consistently met spawner escapement goals, Chinook salmon have made escapement five out of the last 38 years, or 13%, and chum has reached the spawner escapement goal 45% of the time during that same timeframe.

The lack of reaching management objectives in Willapa Bay led to the development of a Willapa Bay Management Plan. The purpose of the plan was increased conservation of natural origin salmonids by focusing harvest on abundant hatchery fish and to institute finer scale fishery management. The plan was enacted in 2010 although it was never ratified by the Commission. The plan proposed to reach its objectives by initiating mark selective fisheries, placed a moratorium on directed chum fishing, and designated the Naselle River Chinook salmon stock as "primary" under hatchery reform principles. Also, a harvest rate cap of 30% was put in place for natural origin Naselle River Chinook salmon. The plan also addressed the need for conservation measures on chum by limiting harvest to no more than 10% of the total adult return and not allowing for commercial fisheries during the chum management period, October 15 to October 31.

As public trust and support for the salmon management actions in Willapa Bay continued to erode, the Department initiated a more robust public process to develop a comprehensive Willapa Bay Salmon Management Policy beginning in 2014. The intent of the Policy was to provide fishery managers with general guidance and management objectives for salmon fisheries prosecuted within Willapa Bay. The Ad-Hoc WBSAG was formed from recreational and commercial stakeholders with representation from the conservation sector as well to gather stakeholder input on conservation and fishery values during the Policy development process. This process lasted ten months, from September 2014 to June 2015, when the Willapa Bay Salmon Management Policy (C-3622) was signed by the Commission. The objectives outlined in the Policy are to achieve the restoration of wild salmon and avoid ESA designation. The Policy also sought to maintain the economic well-being and stability of the fishing industry, provide an appropriate distribution of fishing opportunities, and called for enhanced transparency, information sharing, and improved technical rigor. These actions were meant to restore the public's trust and support for salmon management in Willapa Bay.

In June 2015, the Policy was adopted by the FWC as the Willapa Bay Salmon Management Policy C-3622. The objectives of the Policy are "to achieve the conservation and restoration of wild salmon in Willapa Bay and avoid ESA designation of any salmon species. Where consistent with this conservation objective, the Policy also seeks to maintain or enhance the economic well-being and stability of the commercial and recreational fishing industry in the state, provide the public with outdoor recreational experiences, and an appropriate distribution of fishing opportunities throughout the Willapa Bay basin. Enhanced transparency, information sharing, and improved technical rigor of fishery management are needed to restore and maintain public trust and support for management of Willapa Bay salmon

fisheries." The Policy recognizes uncertainty in implementation, and depends on continued economic and biological analysis, as well as an adaptive management approach.

Policy C-3622 utilizes 11 guiding principles to reach the objectives outlined above as well as providing species specific guidance for each of the naturally occurring salmonid stocks in Willapa Bay. For Chinook salmon, a two-phase rebuilding program was put in place with phase one occurring from 2015 to 2018. Willapa River and Naselle River natural origin Chinook salmon were designated as "primary" and "contributing" under hatchery reform principles and an impact rate cap of 20% was to be planned for preseason on these stocks. Chinook salmon harvest was prioritized to the recreational sector and time and area constraints were used to direct commercial harvest on coho and chum. Hatchery production for Chinook salmon was expressly outlined in the Policy. Also, a 10% impact rate cap for chum was to be planned for preseason until spawner escapement goals were reached on a more consistent basis. The Policy also set timelines for meeting hatchery reform principles. In phase two, beginning in 2019, the impact rate cap to Willapa River and Naselle River natural origin Chinook salmon would then be reduced to 14%. These actions are meant to enable natural origin Chinook salmon stocks to meet spawner escapement goals in 16 to 21 years after policy implementation (e.g. 2015).

The implementing structure of the Policy consisted of two phases; phase-one covered years one through four post adoption (2015 through 2018 fisheries) and phase-two, years five through 21 (July 2019 through June 2035). In 2018 and 2019, the FWC provided staff with additional guidance for management of salmon fisheries prosecuted in Willapa Bay applicable to the 2018 and 2019 seasons only.

The Commission requested a comprehensive and thorough review of the implementation and performance of the Policy in phase one. This report is intended to satisfy the Policy intent for the comprehensive review.

2.3 Task

The Commission tasked staff to prepare a comprehensive evaluation of the Policy that:

- Reports on the implementation and performance of the Policy in relation to the stated purpose and goals, guiding principles, and species-specific guidance;
- Provides information relevant to 36 evaluation questions asked by the Commission on April 18, 2018;
- Included the opportunity for the appropriate public advisory bodies to review and comment on the report provided to the Commission, in an open and transparent manner;
- Included any analytical perspectives or elements from staff; and
- Provided a narrative that summarizes the analysis in a succinct and understandable approach.

2.4 Approach

The analytical approach of this review was to provide information and supporting data on the implementation and performance of Policy C-3622 as well as provide answers to the 36 questions provided by the Commission. The answers to the questions are not presented sequentially, but rather are grouped into the following six chapters: General Fisheries Management, Fall Chinook salmon Management, Coho Management, Chum Management, Adaptive Management, and Economics. A brief report card summary on the implementation of Policy C-3622 is shown below, conceptually color coded with red = no, yellow = mixed, on-going, and green = yes.

The following chapters cover each of the five chapters of Policy C-3622 with an additional chapter added to report on the economics of the fisheries. The general approach taken within each section of the

document is to provide a direct citation from the Policy, followed by information and supporting data on the implementation and performance. The specific Commissioner's emphasis questions were placed at the end of each corresponding section, where applicable, with answers and supporting data provided.

2.5 Policy Implementation Report Card

Table 1. Report card for the comprehensive review of the Willapa Bay Salmon Management Policy C-3622

General Fisheries Management	Color	Comment
Prioritize restoration and conservation of wild salmon		Mixed, on-going
Work with partners to protect and restore habitat productivity		Mixed, on-going
Implement improved broodstock management		Mixed, pHOS not met in all areas

Investigate and promote the development and implementation of alternative selective gear		Mixed, only tangle nets tested
Work through the Pacific Salmon Commission to promote conservation objectives		Mixed, on-going
Monitoring, sampling and enforcement programs to account for species impacts		Yes, implemented
In-season management actions to meet conservation and management objectives		Yes, implemented
Transparency of salmon management and catch accounting		Yes, implemented
Improved fishery management and technical tools		Mixed, on-going
Promote mark-selective fisheries		Yes, implemented
Chinook Management		
Population designations - Willapa River; primary, Naselle River; contributing		Yes, implemented
20% impact rate on Willapa and Naselle River natural origin Chinook		Yes, pre-season
		No, post-season
Prioritize recreation fishing opportunities		Yes, implemented
Alternative gear set aside		Yes, pre-season
		No, post-season
Timing of commercial fisheries		Yes, implemented
Hatchery production		Mixed, not in all facilities
Coho Management		
Population designations		Yes, implemented
Achieve aggregate spawner goal		Yes, pre-season
		No, post-season
Prioritize commercial fishing opportunities		Yes, implemented
Chum Management		
Population designations		Yes, implemented
Achieve aggregate spawner goal		Yes, pre-season
		No, post-season
Prioritize commercial fishing opportunities		Yes, implemented
10% impact rate cap		Yes, implemented
Adaptive Management		
Conduct annual fishery management review		Yes
Improve in-season management		Mixed, on-going
Review spawner goals		Mixed, on-going
Comprehensive hatchery assessment		Yes
Ocean ranching report		Yes

3.0 Policy C-3622 with Evaluation Emphasis Questions

POLICY TITLE: Willapa Bay Salmon Management **POLICY NUMBER: C-3622**

Cancels or Effective Date: June 13, 2015

Supersedes: NA

Termination Date: December 31, 2023

See Also: Policies C-3608, C-3619

Approved June 13, 2015

Chair

Washington Fish and Wildlife Commission

Purpose

The objective of this policy is to achieve the conservation[1] and restoration of wild salmon in Willapa Bay[2] and avoid ESA designation of any salmon species[3]. Where consistent with this conservation objective, the policy also seeks to maintain or enhance the economic well-being and stability of the commercial[4] and recreational fishing industry[5] in the state, provide the public with outdoor recreational experiences[6], and an appropriate distribution of fishing opportunities throughout the Willapa Bay Basin[7]. Enhanced transparency, information sharing, and improved technical rigor of fishery management are needed to restore and maintain public trust and support for management of Willapa Bay salmon fisheries.

Definition and Goal

This policy sets a general management direction and provides guidance for Washington Department of Fish and Wildlife (Department) management of all Pacific salmon returning to the Willapa Bay Basin. The Willapa Bay Basin is defined as Willapa Bay and its freshwater tributaries.

---

[1] What are the aggregate fishery impact rates and status of achieving the conservation goals of each species in the four years of policy implementation in comparison to the four-year period prior to the policy adoption?

[2] What populations of salmon were in need of restoration during the four years prior to Policy adoption and what is their current status? (Note the distinction between population status restoration and habitat restoration as referenced in Question 10.)

[3] What is the pattern of abundance for all areas in the ESU of each species in the 20 years prior to Policy adoption and has that pattern changed as a result of Policy C-3622 implementation?

[4] What is the average ex-vessel value of the commercial fishery landings in the four years of policy implementation in comparison to a four-year base period prior to the policy adoption, normalized to eliminate the variations in annual run sizes and annual price per pound?

[5] What is the number of angler trips during the four years of policy implementation in comparison to a four-year base period prior to the policy adoption, normalized to eliminate the variability of annual run sizes?

[6] Is there a discernable measurement to show if there has been any change in non-fishing related outdoor recreational experiences available to the public? If so, does it show that this policy intent was achieved, or that there has been a change in such recreational opportunity since the Policy was adopted?

[7] What has been the change in the distribution of fishing effort throughout the Willapa Bay Basin during 2015-18 in comparison to the four-year period prior to Policy adoption?

General Policy Statement

This policy provides a cohesive set of principles and guidance to promote the conservation of wild salmon and steelhead and improve the Department's management of salmon in the Willapa Bay Basin. The Washington Fish and Wildlife Commission (Commission) recognizes that management decisions must be informed by fishery monitoring (biological and economic), and that innovation and adaptive management will be necessary to achieve the stated purpose of this policy[8]. By improving communication, information sharing, and transparency, the Department shall promote improved public support for management of Willapa Bay salmon fisheries.

State commercial and recreational fisheries will need to increasingly focus on the harvest of abundant hatchery fish. Mark-selective fisheries are a tool that permits the harvest of abundant hatchery fish while reducing impacts on wild stocks needing protection. As a general policy, the Department shall implement mark-selective salmon fisheries[9], unless the wild populations substantially affected by the fishery are meeting spawner (e.g., escapement goal) and broodstock management objectives. In addition, the Department may consider avoidance, alternative gears, or other selective fishing concepts along with other management approaches provided they are as or more effective than a mark-selective fishery in achieving spawner and broodstock management objectives.

Fishery and hatchery management measures should be implemented as part of an "all-H" strategy that integrates hatchery, harvest, and habitat systems. Although the policy focuses on fishery management, this policy in no way diminishes the significance of habitat protection and restoration.

Guiding Principles

The Department shall apply the following principles in the management of salmon in the Willapa Bay Basin:

1) Prioritize the restoration and conservation of wild salmon through a comprehensive, cohesive, and progressive series of fishery, hatchery, and habitat actions.

2) Work with our partners (including Regional Fishery Enhancement Groups, nonprofit organizations, the public and Lead Entities) to protect and restore habitat productivity[10].

[8] Over the course of the first four years of Policy implementation, has there been any adaptive changes to the management prescribed in the 2015 Policy as written? If so, describe the change and when it occurred, the rationale for the change, and if the change accomplished the objective.

[9] What mark-selective fisheries have been implemented since Policy adoption that were not in place prior to Policy adoption?

[10] What habitat restoration projects were implemented after Policy adoption as a result of this Policy? (Note the distinction between habitat restoration and population status restoration as referenced in Question 2.)

3) Implement improved broodstock management (including selective removal of hatchery fish) to reduce the genetic and ecological impacts of hatchery fish and improve the fitness and viability of salmon produced from Willapa Bay rivers[11] (see Hatchery and Fishery Reform Policy C-3619). Achieve Hatchery Scientific Review Group (HSRG) broodstock management standards for Coho and Chum salmon by 2015[12], and work toward a goal of achieving standards for Chinook salmon by 2020[13].

4) Investigate and promote the development and implementation of alternative selective gear. The development of alternative selective gear may provide an opportunity to target fishery harvests on abundant hatchery fish stocks, reduce the number of hatchery-origin fish in natural spawning areas, limit mortalities on non-target species and stocks, and provide commercial fishing opportunities.

5) Work through the Pacific Salmon Commission to promote the conservation of Willapa Bay salmon and, in a manner consistent with the provisions of the Pacific Salmon Treaty, pursue the implementation of fishery management actions necessary to achieve agreed conservation objectives.

6) Within the Pacific Fishery Management Council (Council) process, support management measures that promote the attainment of Willapa Bay conservation objectives consistent with the Council's Salmon Fishery Management Plan.

7) Monitoring, sampling, and enforcement programs will adequately account for species and population impacts (landed catch and incidental fishing mortality) of all recreational and commercial fisheries and ensure compliance with state regulations. Develop and implement enhanced enforcement strategies to improve compliance with fishing regulations and ensure orderly fisheries.

8) If it becomes apparent that a scheduled fishery will exceed the aggregated pre-season natural-origin Chinook mortality (impact) expectation, the Department shall implement in-season management actions in an effort to avoid cumulative mortalities of natural-origin Chinook in excess of the aggregated pre-season projection.

9) Salmon management and catch accounting will be timely, well documented, transparent, well-communicated, and accountable. The Department shall strive to make ongoing improvements in the transparency of fishery management and for effective public involvement in planning Willapa Bay salmon fisheries, including rule-making processes. These shall include: a) clearly describing

[11] Are there HGMPs for the hatcheries in the Willapa Bay Basin? If so, insert a link in the analysis.

[12] What are the specific wild broodstock management standards for coho and chum salmon that are referred to, and were they achieved by 2015? If not by then, have they been achieved since 2015? If not, what progress was made of the course of 2015-18 in comparison to a base period prior to Policy adoption?

[13] What are the specific wild broodstock management standards for chinook salmon that are referred to, and what progress was made over the course of 2015-18 in comparison to a base period prior to Policy adoption?

management objectives in a document available to the public prior to the initiation of the preseason planning process; b) enhancing opportunities for public engagement during the preseason fishery planning process; c) communicating in-season information and management actions to advisors and the public; and d) striving to improve communication with the public regarding co-management issues that are under discussion.

10) Seek to improve fishery management and technical tools through improved fishery monitoring, the development of new tools, and rigorous assessment of fishery models and parameters[14].

11) When a mark-selective fishery occurs, the mark-selective fishery shall be implemented, monitored, and enforced in a manner designed to achieve the anticipated conservation benefits[15].

Fishery and Species-Specific Guidance

Subject to the provisions of the Adaptive Management section, the following fishery-and species-specific sections describe the presumptive path for achieving conservation objectives and an appropriate distribution of fishing opportunities.

Fall Chinook Salmon

Subject to the adaptive management provisions of this policy, the Department will manage fall Chinook salmon fisheries and hatchery programs consistent with the Guiding Principles and the following additional guidance:

1) The Department shall initiate a two-phase rebuilding program to conserve and restore wild Chinook salmon in Willapa Bay. The progressive series of actions is intended to result in achieving broodstock management standards by 2020 and spawner goals by years 16-21. Within the conservation constraints of the rebuilding program, Chinook salmon will be managed to provide for a full recreational fishing season with increased participation and/or catch anticipated in future years[16].

2) Rebuilding Program - Phase 1 (Years 1-4). The objectives of Phase 1 shall be to

[14] With the understanding that department staff as a whole is constantly in a mode of incorporating improvements in technical fishery management capabilities as new approaches or refinements are vetted, even when minor, what are the three most significant advancements in technical fishery management capabilities for Willapa Bay salmon over the course of the Policy to date? If less than three, state any that fit a threshold of reasonably high significance.

[15] With cross reference to question 9, what has been the conservation benefit from mark-selective fisheries newly implemented as a result of this Policy, and how do they compare to the benefits anticipated when the new fishery regulations were set?

[16] Has there been any recreational fishing closures from normally open seasons for chinook salmon over the course of 2015-18, what are the angler trip and catch estimates for the recreational fishery for chinook salmon 2015-18, and how do they compare with the four years prior to adoption of this Policy?

increase the number of natural-origin spawners[17] and implement hatchery program modifications designed to meet broodstock management standards in the subsequent cycle.

a. Implement hatchery broodstock management actions to promote re-adaptation to the natural environment and enhance productivity of natural-origin Chinook salmon in the North/Smith, Willapa, and Naselle rivers:

- North/Smith – Manage as Wild Salmon Management Zone with no hatchery releases of Chinook salmon.

- Willapa – Implement an integrated program with hatchery broodstock management strategies designed to achieve broodstock management standards consistent with a Primary designation in the subsequent cycle[18].

- Naselle – Implement hatchery broodstock strategies designed to achieve broodstock management standards consistent with a Contributing designation in the subsequent cycle[19].

b. Pursue implementation of additional mark-selective commercial fishing gear to enhance conservation and provide harvest opportunities. The Department shall provide to the Commission by January 2017 a status report and by January 2018 an assessment of options to implement additional mark-selective commercial fishing gear in Willapa Bay. The assessment shall identify the likely release mortality rates for each gear type, the benefits to rebuilding naturally spawning populations, and the benefits and impacts to the commercial fishery[20].

3) Rebuilding Program - Phase 2 (Years 5 – 21). The combination of fishery and harvest management actions is projected to result on average in the achievement of spawner goals for the North, Naselle, and Willapa populations in the years 16-21. Additional fishery and hatchery management actions will be considered during this time period if the progress toward the spawner objectives is inconsistent with expectations.

4) Fishery Management Objectives. The fishery management objectives for fall Chinook salmon, in priority order, are to:

[17] Has there been an increase in the overall number of natural-origin chinook spawners in the Willapa basin, or an increase in specific river systems?

[18] What is the working definition of an "integrated program" and a "Primary designation" in this situation and what modifications of the hatchery program were implemented during 2015-18 to achieve the objective of this paragraph?

[19] What is the working definition of a "Contributing designation" in this situation and what modifications of the hatchery program were implemented during 2015-18 to achieve the objective of this paragraph?

[20] Were the 2017 report and the 2018 assessment of options completed and if so, what are the highlights of the reports? The links to these reports should be included in the analysis.

a. Achieve spawner goals for the North, Naselle, and Willapa stocks of natural-origin Chinook and hatchery reform broodstock objectives through the two phase rebuilding program described above.

b. Provide for an enhanced recreational fishing season. The impact rate of the recreational fishery is anticipated to be ~3.2% during the initial years of the policy, but may increase in subsequent years[21] to provide for an enhanced recreational season as described below:

- Manage Chinook salmon for an enhanced recreational fishing season to increase participation and/or catch including consideration of increased daily limits, earlier openings, multiple rods, and other measures[22].

- Conservation actions, as necessary, shall be shared equally between marine and freshwater fisheries.

c. Provide opportunities for commercial fisheries within the remaining available fishery impacts.

5) Fishery Management in 2015-2018. To facilitate a transition to the Willapa River as the primary Chinook salmon population, fisheries during the transition period will be managed with the following goal:

a. The impact rate on Willapa and Naselle river natural-origin fall Chinook in Willapa Bay fisheries shall not exceed 20%[23]. Within this impact rate cap, the priority shall be to maintain a full season of recreational fisheries for Chinook salmon in the Willapa Bay Basin.

b. To promote the catch of hatchery-origin Chinook salmon and increase the number of natural-origin spawners, within the 20% impact rate cap the following impact rates shall be set-aside for mark-selective commercial fishing gear types with an anticipated release mortality rate of less than 35%[24]:

Fishing Year	Mark-Selective Commercial Fishing Gear Set-Aside
2015	1%
2016	2%

[21] What has been the chinook recreational fishery impact rate 2015-18 and the four years prior to Policy adoption?
[22] What changes in these recreational fishery management measures occurred during 2015-18, from the four-year period prior to Policy adoption?
[23] What are the actual aggregate Willapa Bay chinook impact rates that occurred 2015-18, in comparison to the four years prior to Policy implementation?
[24] What were the actual annual pre-season planned impact rate set-asides for mark selective commercial fishing gear and what were the actual post-season impact rates that occurred, over the course of 2105-18, in comparison to the set-asides called for in the Policy?

2017	6%
2018	6%

The Commission may consider adjustments to the set-asides for 2017 and 2018 based upon the Department's reports to the Commission on commercial mark-selective fishing gear (paragraph 2(b)) or other adaptive management considerations.

c. No commercial Chinook fisheries shall occur in areas 2T and 2U prior to September 16.

d. No commercial Chinook fisheries shall occur in areas 2M, 2N, 2P and 2R until after Labor Day.

6) Fishery Management After 2018. Fisheries in the Willapa Bay Basin will be managed with the goal of:

a. Limiting the fishery impact rate on Willapa and Naselle river natural-origin fall Chinook salmon to no more than 14%.

b. No commercial fisheries shall occur within areas 2T and 2U prior to September 16.

c. No commercial Chinook fisheries shall occur in areas 2M, 2N, 2P and 2R until after September 7.

7) Maintaining Rebuilding Trajectory. If the postseason estimate (as presented at the annual Commission review) of aggregated natural-origin Chinook salmon mortality (impacts) exceeds the preseason projection, the Department staff shall make a recommendation to the Commission regarding an adjustment to the allowable impacts for the subsequent year[25]. The recommendation shall be based upon the percentage by which the postseason estimate of impacts exceeded the preseason projection, but may consider other factors such as the predicted abundance or other relevant factors[26].

8) Hatchery Production. Within budgetary constraints, and at the earliest feasible date, the Department shall seek to implement the following hatchery production[27] of fall Chinook salmon:

- 0.80 million at Naselle Hatchery
- 3.30 million at Nemah Hatchery
- 0.35 million at Forks Creek Hatchery

Coho Salmon

[25] What has been the staff understanding of the policy intent of this provision?

[26] What is an example of how this provision would have been implemented, and was it ever implemented 2015-18?

[27] What are the actual fall chinook production and release location specifics for the hatcheries listed and how does this compare to the four years prior to Policy adoption?

Subject to the adaptive management provisions of this policy, the Department will manage Coho salmon fisheries and hatchery programs consistent with the Guiding Principles and the following objectives:

1) Broodstock Management Strategies. Manage Coho salmon with the following designations and broodstock management strategies:

	North/Smith	Willapa	Naselle
Designation	Primary	Primary	Stabilizing[28]
Broodstock Strategy	No Hatchery Program	Integrated	Integrated

Coho salmon returning to all other watersheds will be managed consistent with a Contributing designation.

2) Fishery Management Objectives. The fishery management objectives for Coho salmon, in priority order, are to:

a. Manage fisheries with the goal of achieving the aggregate spawner goal for Willapa Bay natural-origin Coho salmon. When the pre-season forecast of natural-origin adult Coho is less than the aggregate goal, or less than 10% higher than the aggregate goal, fisheries in the Willapa Bay Basin will be scheduled to result in an impact of no more than 10% of the adult return[29];

b. Prioritize commercial fishing opportunities during the Coho fishery management period (September 16 through October 14); and

c. Provide recreational fishing opportunities[30].

Chum Salmon

Subject to the adaptive management provisions of this policy, the Department will manage Chum salmon fisheries and hatchery programs consistent with the Guiding Principles and the following objectives:

1) Broodstock Management Strategies. Manage Chum salmon with the following designations and broodstock management strategies:

[28] What is the working definition of a "Stabilizing" designation in this situation?

[29] Over the course of 2015-18, was the policy intent of this provision achieved, and if the "10% or less" features were used, what were the pre-season and post-season fishery impact rates for those particular years?

[30] Over the course of 2015-18, were recreational fisheries for coho salmon closed for conservation purposes? If so, describe the commercial fishery opportunity in that same year.

	North/Smith	Palix	Bear
Designation	Primary	Contributing[31]	Primary
Broodstock Strategy	No Hatchery Program	No Hatchery Program	No Hatchery Program

Chum salmon returning to all other watersheds will be managed consistent with a Contributing designation.

2) Fishery Management Objectives. The fishery management objectives for Chum salmon, in priority order, are to:

   a. Achieve the aggregate goal for naturally spawning Chum salmon and meet hatchery reform broodstock objectives (see bullet 3);

   b. Provide commercial fishing opportunities during the Chum salmon fishery management period (October 15 through October 31); and

   c. Provide recreational fishing opportunities[32]. Recreational fisheries will be allowed to retain Chum salmon.

3) Fisheries will be managed with the goal of achieving the aggregate goal for Willapa Bay naturally spawning Chum salmon. Until the spawner goal is achieved 2 consecutive years, the maximum fishery impact shall not exceed a 10% impact rate and no commercial fisheries will occur in the period from October 15-31. If the number of natural-origin spawners was less than the goal in 3 out of the last 5 years, the Department shall implement the following measures[33]:

   a. The predicted fishery impact for Chum in Willapa Bay Basin will be scheduled to result in an impact of no more than 10% of the adult return.

   b. When the Chum pre-season forecast is 85% or less of the escapement goal, the predicted fishery impact for Chum in Willapa Bay Basin will be scheduled to result in an impact of no more than 5% of the adult return.

4) The Department shall evaluate opportunities to increase hatchery production of Chum salmon. If Chum salmon hatchery production is enhanced, beginning as early as 2018, fisheries in the Willapa Bay Basin may be implemented with a fishery impact limit of no more than 33% of the natural-origin Chum salmon return.

[31] What is the working definition of a "Contributing" designation for the Palix River with no hatchery program in place?

[32] Over the course of 2015-18, were recreational fisheries for chum salmon closed for conservation purposes? If so, describe the commercial fishery opportunity in that same year.

[33] Over the course of 2015-18, was the policy intent of this provision, including 3.a and 3.b, achieved? If any of the fishery impact rate specifications were implemented 2015-18, what were the pre-season and post-season fishery impact rates for those particular years?

Adaptive Management

The Commission recognizes that adaptive management will be essential to achieve the purpose of this policy. Department staff may implement actions to manage adaptively to achieve the objectives of this policy and will coordinate with the Commission, as needed, in order to implement corrective actions.

The Commission will also track implementation and results of the fishery management actions and artificial production programs in the transition period, with annual reviews beginning in 2016 and a comprehensive review at the end of the transition period (e.g., 2019). Fisheries pursuant to this Policy will be adaptive and adjustments may be made. Department staff may implement actions necessary to manage adaptively to achieve the objectives of this policy and shall coordinate with the Commission, as needed, in order to implement corrective actions.

Components of the adaptive management will be shared with the public through the agency web site and will include the following elements:

1) Conduct Annual Fishery Management Review. The Department shall annually evaluate fishery management tools and parameters, and identify improvements as necessary to accurately predict fishery performance and escapement.

2) Improve In-season Management. The Department shall develop, evaluate, and implement fishery management models, procedures, and management measures that are projected to enhance the effectiveness of fishery management relative to management based on preseason predictions.

3) Review Spawner Goals. The Department shall review spawner goals to ensure that they reflect the current productivity of salmon within the following timelines:

    a. Chum: September 1, 2016
    b. Coho: January 1, 2016[34]
    c. Chinook: January 1, 2020

4) Comprehensive Hatchery Assessment. The Department shall complete a comprehensive review of the hatchery programs in the Willapa Bay region by June 2016[35]. The review shall identify the capital funding necessary to maintain or enhance current hatchery programs, identify changes in release locations or species that would enhance recreational and commercial fishing opportunities, identify improvements or new weirs to increase compliance with broodstock management, and the use of re-use water systems, water temperature manipulation to increase production hatchery capacity.

[34] What changes, if any, occurred as a result of this review? The analysis should provide the links to these reviews.
[35] What are the most significant results of this review? The analysis should provide the link to this review.

5) Ocean Ranching Opportunities. The Department shall complete by January 2016 a comprehensive review of opportunities and constraints to implement ocean ranching of salmon in Willapa Bay[36].

Delegation of Authority

The Commission delegates the authority to the Director, through the North of Falcon stakeholder consultation process, to set seasons for recreational and commercial fisheries in the Willapa Bay Basin, and to adopt permanent and emergency regulations to implement these fisheries.

This guidance establishes a number of important conservation and allocation principles for the Director and agency staff to apply when managing the fishery resources of Willapa Bay. While this policy establishes a clear presumptive path forward with regard to many of the identified objectives, those principles and concrete objectives are intended to guide decision-making and are not intended to foreclose adaptive management based upon new information. Nor does this guidance preclude the need to gather and consider additional information during the annual process of developing fishery plans and the associated rule-making processes that open fisheries in Willapa Bay. The Commission fully expects that the Director and agency staff will continue to communicate with the public, and the Commission, to consider new information, evaluate alternate means for carrying out policy objectives, and consider instances in which it may make sense to deviate from the presumptive path forward. That is the nature of both adaptive management, and policy implementation, when faced with a dynamic natural environment.

4.0 General Fisheries Management

The Willapa Bay Salmon Management Policy C-3622 provides "general management direction and guidance for Washington Department of Fish and Wildlife management of all Pacific Salmon returning to the Willapa Bay Basin." The objectives of the Policy are to "achieve conservation and restoration of wild salmon", "avoid ESA designation of any salmon species", "maintain or enhance the economic well-being and stability of the commercial and recreational fishing industry", "provide the public with outdoor recreational experiences", and "appropriate distribution of fishing opportunities." The Policy strives to achieve these objectives by providing 11 guiding principles as well as species specific guidance for each of the naturally occurring salmonid stocks within the basin. During policy development and implementation staff met with the Fish Committee and provided updates to the full Commission on a regular basis. Fish Committee meetings are open to the public and those who attended these meetings were able to provide input.

[36] What key opportunity and constraints were identified in this report? The analysis should provide the link to this review.

The following section of this report will focus on the implementation and performance of Policy C-3622 in relation to the 11 guiding principles described in the document. The guiding principles are not addressed in sequential order but have been arranged in a manner to manage the flow of the document.

Lastly, guiding principles #5 and #6 both address working with federal entities (i.e. Pacific Salmon Commission and Pacific Fishery Management Council) to promote the conservation of Willapa Bay salmon species and the objectives of this Policy. The discussion of the implementation and performance of these guiding principles are combined and are addressed in section 4.10.

4.1 Conservation and Restoration of Wild Salmon

Policy Citation - Guiding Principle #1: *Prioritize the restoration and conservation of wild salmon through a comprehensive, cohesive, and progressive series of fishery, hatchery, and habitat actions.*

Since ratification of Policy C-3622 in June of 2015, the Department has prioritized the restoration and conservation of wild salmon through a series of fishery and hatchery management actions. Fisheries have been planned pre-season to conform to harvest control rules and time, place, and manner restrictions outlined in the corresponding species-specific guidance section of the Policy. Improvements have been made in hatchery management, although full implementation of the hatchery reform principles has been hampered due to infrastructure and budgetary issues. The Department has also taken steps to increase communication and collaboration between the fish and habitat programs within the Department and with outside partners (e.g. Pacific County Lead Entity and Coast Salmon Partnership). More detailed discussion regarding hatchery management and habitat restoration objectives will be discussed in section 4.8 and 4.9, respectively.

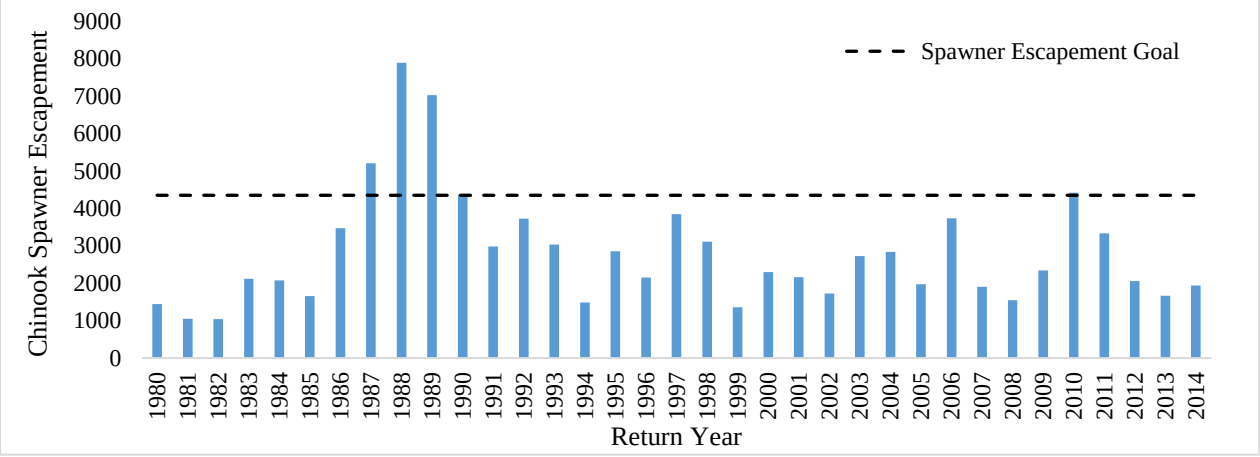


Figure 2. Willapa Bay Chinook salmon natural origin spawner escapement from 1980 to 2014 (estimated).

Harvest control rules directed at species of concern are a valuable tool for fishery managers to advance conservation. These types of rules coupled with time, place, and manner regulations allow fishery

managers to focus fishery opportunity on abundant hatchery stocks, while limiting impacts to stocks in need of conservation. During policy development, Willapa Bay Chinook salmon and chum stocks were identified as the salmon species in need of more focused conservation and restoration actions. This was driven by the acknowledgement that these two salmon species had consistently not met conservation and management objectives expressed in terms of spawner escapement goals. For the time period from 1980 to 2014, Willapa Bay natural origin Chinook salmon have exceeded the spawner escapement objective of 4,353, four times or 11% (Figure 2). Willapa Bay chum have reached their spawner escapement objective 12 times or 34% during the same time span (Figure 4). In contrast, Willapa Bay natural origin coho have achieved the spawner objective in all but two years or 89% in the time frame from 1996 to 2014.

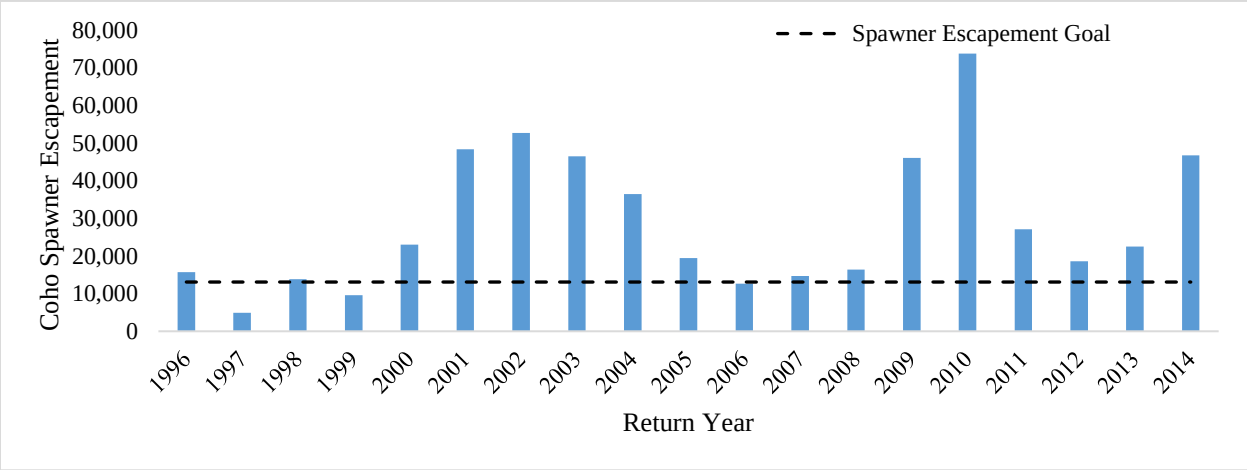


Figure 3. Estimated Willapa Bay coho natural origin spawner escapements from 1996 to 2014.

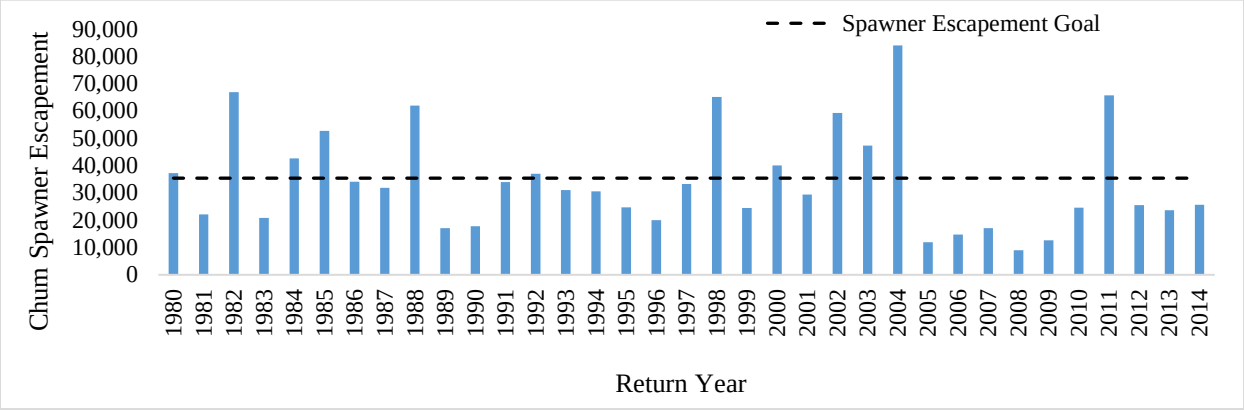


Figure 4. Estimated Willapa Bay chum spawner escapement from 1980 to 2014.

Given the historical status of Chinook salmon, coho, and chum stocks within Willapa Bay, Policy C-3622 provides guidance to increase the conservation focus of fishery management actions for Chinook salmon and chum, while also providing language to ensure coho stocks maintain a healthy abundance. For Chinook salmon, the Policy guidance is to initiate a two-phase rebuilding program with phase one occurring in years 1-4 (e.g. 2015-2018) and phase two occurring from years 5-21 (e.g. 2019-2035), with the expected result of reaching spawner goals in years 16-21. The objective, in terms of fisheries

management, was to increase the number of natural origin spawners. Guidance provided to reach this objective for Chinook salmon was to initiate a harvest control rule on Willapa and Naselle River natural origin fall Chinook salmon. The harvest control rule is defined as limiting fisheries to a 20% terminal impact rate cap to be used during the pre-season fisheries planning process. Table 2 provides the finalized pre-season estimates of fishery impacts in relation to the harvest control rule or management objective for that species. The pre-season prediction of fisheries prosecution for all years in phase one has been below the harvest control rule. The average predicted fishery impact rate for years 2015-2018 was 19.6% and 18.2% for Willapa and Naselle River natural origin fall Chinook salmon, respectively. While the Policy directs the Department to manage Chinook salmon fisheries for limited impacts to Willapa and Naselle rivers pre and post season, the available tools to fish managers to assess in-season management only allows for assessing impacts to the Willapa Bay Chinook salmon stock in the aggregate. In other words, the Department lacks the data to accurately predict impacts to just the Willapa and Naselle River in-season.

Table 2. Pre-season prediction of management objectives for years 2015-2018. Predictions generated by the Willapa Bay Terminal Area Management Model (TAMM).

Species	**Chinook**			**Coho**	**Chum**
Location	**Willapa River**	**Naselle River**	**Willapa Bay**	**Willapa Bay**	**Willapa Bay**
Harvest Control Rule	**20%**	**20%**	**20%**	**13,600 spawners***	**10%**
2015	20.00%	18.80%	19.20%	26,795	10.00%
2016	19.50%	19.40%	20.00%	26,012	9.90%
2017	19.80%	17.90%	19.30%	20,719	10.00%
2018	18.90%	16.80%	17.80%	15,243	9.00%
Average	***19.60%***	***18.20%***	***19.10%***	***22,192***	***9.70%***

The Policy provides more flexibility in regard to limiting harvest on chum stocks in order to achieve conservation and management objectives. As discussed above, Willapa Bay chum have reached their spawner escapement goal 34% of the time historically. In order to prioritize conservation and restoration of this stock, a harvest control rule is described in the Policy that accounts for the stocks recent history of meeting the spawner escapement goal. Policy guidance around harvest management of chum is as follows:

"*Fisheries will be managed with the goal of achieving the aggregate goal for Willapa Bay naturally spawning Chum salmon. Until the spawner goal is achieved 2 consecutive years, the maximum fishery impact shall not exceed a 10% impact rate and no commercial fisheries will occur in the period from October 15-31. If the number of natural origin spawners was less than the goal in 3 out of the last 5 years, the Department shall implement the following measures:*

> *a. The predicted fishery impact for Chum in Willapa Bay Basin will be scheduled to result in an impact of no more than 10% of the adult return.*
>
> *b. When the Chum pre-season forecast is 85% or less of the escapement goal, the predicted fishery impact for Chum in Willapa Bay Basin will be scheduled to result in an impact of no more than 5% of the adult return."*

Willapa Bay chum stocks have not met the criteria necessary to bypass the harvest control rule in any year during phase one. Therefore, the harvest of chum within Willapa Bay for pre-season planning purposes

has been limited to a 10% impact rate. Table 2 shows the fisheries within Willapa Bay have been planned for 10% or less impact to chum during phase one, with the average impact rate predicted pre-season as 9.7%.

Coupled with harvest control rules, the Policy puts in place time and area restrictions for commercial fisheries in order to prioritize conservation and increased abundance of Willapa Bay Chinook salmon and chum stocks. For Chinook salmon, commercial fisheries are restricted to commencing after Labor Day in the south end of the bay, commercial catch areas, 2M, 2N, 2P, and 2R. For the north end of the bay, commercial catch areas 2T and 2U, commercial fisheries are restricted to prosecution prior to September 16 (Figure 5). For chum stocks within Willapa Bay, a time and area restriction for commercial fisheries is tied to the recent history of achieving management objectives. As noted in the Policy passage for chum quoted above, *"until the spawner goal is achieved 2 consecutive years, the maximum fishery impact shall not exceed a 10% impact rate and no commercial fisheries will occur in the period from October 15-31."* Since ratification of the Policy in 2015, final commercial fisheries regulations have been compliant with the Policy language as to time and area restrictions.

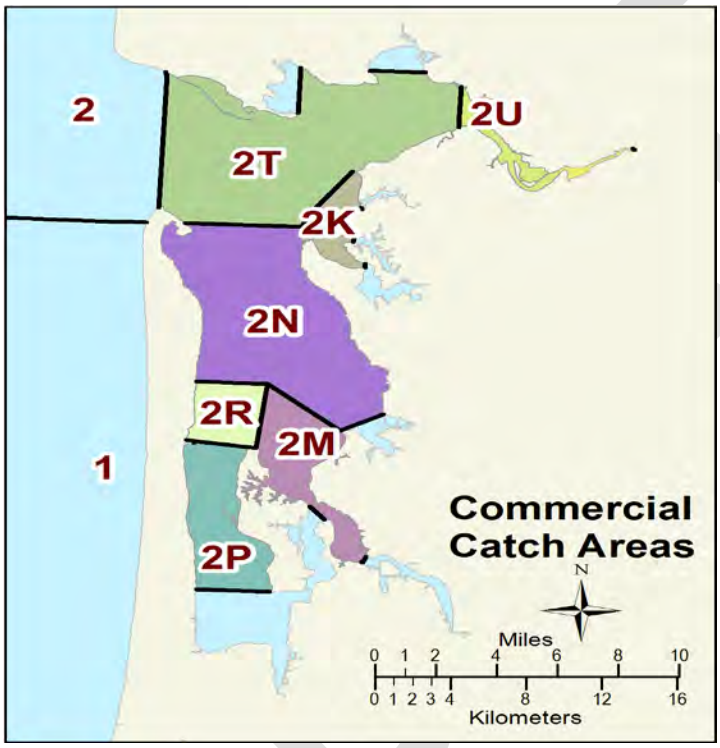


Figure 5. Willapa Bay commercial catch areas.

Willapa Bay coho has had a history of consistently reaching the spawner escapement goal and the Policy language reflects this by describing fishery management objectives with increased flexibility in relation to Chinook salmon and chum objectives. The guidance provided in the Policy regarding Willapa Bay coho is to manage this stock to meet the aggregate natural origin spawner escapement goal. Table 2 shows that in all years, predictions of natural origin escapement were planned to exceed their objective of 13,600 with an average across all years of policy implementation of 22,192 natural-origin coho spawners.

As mentioned above, these more focused conservation actions regarding Willapa Bay fisheries management is intended to increase or maintain the necessary number of natural-origin salmon on the spawning grounds as to provide for sustainable fisheries and fishery management in the future. The

average estimated number of natural-origin Chinook salmon on the spawning grounds from 2000-2014 was 2,446 fish. Similarly, during phase one of the Policy (years 2015-2018), the average estimated number of natural-origin Chinook salmon spawners was 2,363 fish (Figure 6). During the same time period, Willapa Bay chum have exhibited an increase in the number of naturally spawning fish averaging 45,411 fish during phase one as opposed to an average of 32,698 fish from 2000-2014 (Figure 8). More detailed discussion of Chinook salmon and chum management will be covered in sections 5.0 and 7.0, respectively. Conversely, the estimated natural origin spawner abundance of coho within Willapa Bay has experienced a negative trend (Figure 7). For coho, spawner abundances remained stable from 2000-2014 (pre-policy) with the average escapement of 33,681 fish. Post policy, the average escapement was 13,869 fish. This negative trend in coho abundance is not unique to Willapa Bay. This trend has been observed for stocks throughout the Pacific Northwest and is mainly attributed to poor ocean conditions. More detailed discussion on coho management will follow in section 6.0.

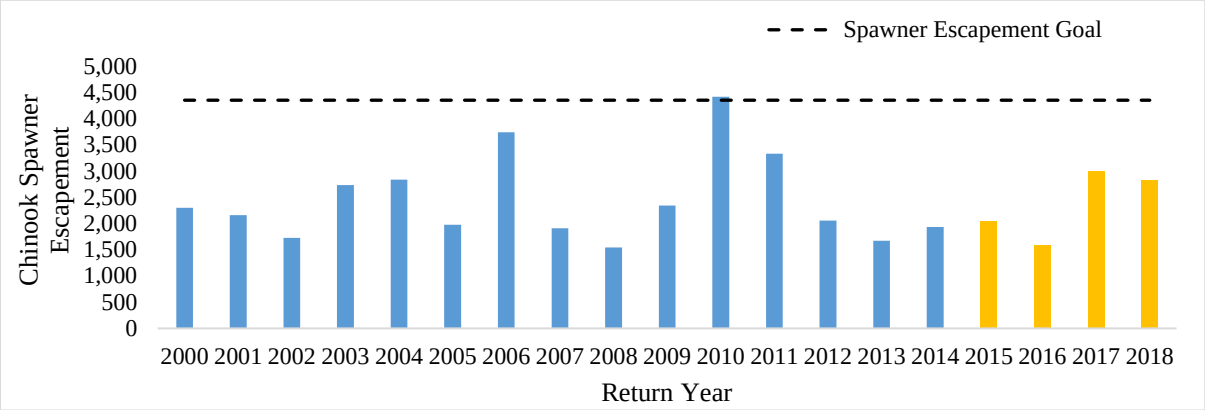


Figure 6. Estimated Willapa Bay natural origin Chinook salmon spawner escapement from 2000-2018. Policy implementation years are highlighted in yellow.

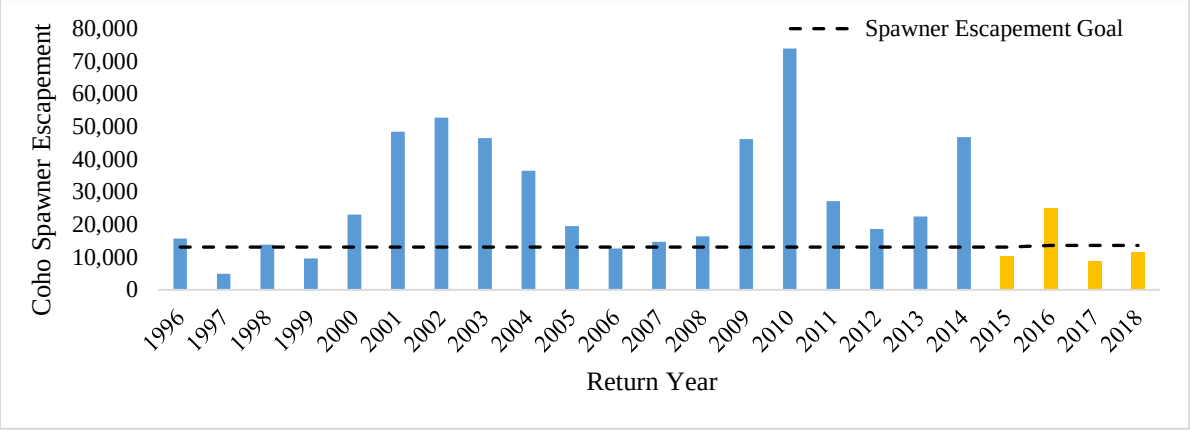


Figure 7. Estimated Willapa Bay natural origin coho spawner escapement from 1996-2018. Policy implementation years are highlighted in yellow.

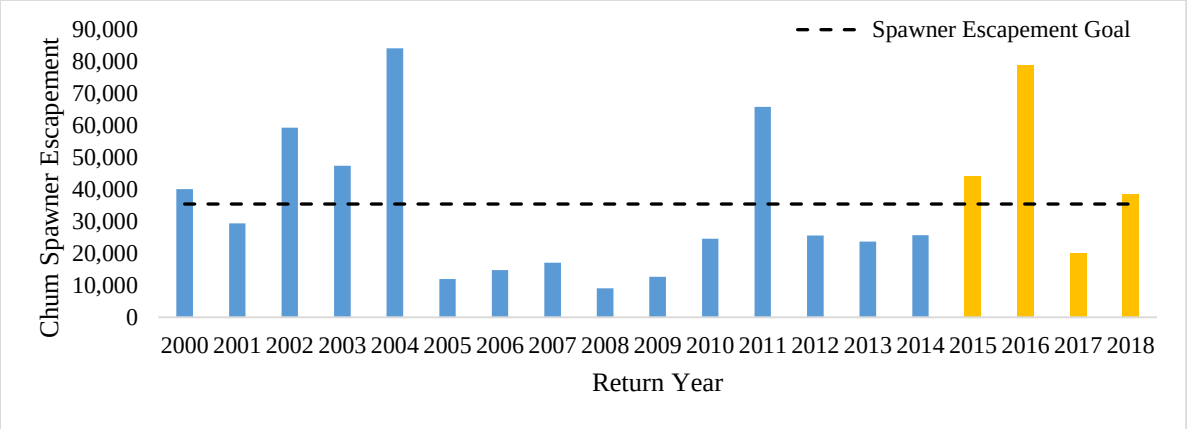


Figure 8. Estimated Willapa Bay chum spawner escapement from 2000-2018. Policy implementation years are highlighted in yellow.

4.1.1. Commissioner's Emphasis Question #1:

What are the aggregate fishery impact rates and status of achieving the conservation goals of each species in the four years of policy implementation in comparison to the four-year period prior to the policy adoption?

The estimated post-season fishery impact rates for Willapa Bay natural-origin Chinook salmon and coho in the four years prior to policy adoption averaged 38.0% and 38.1%, respectively. Since policy adoption the estimated post-season fishery impact rates have averaged 16.6% and 27.8% for Willapa Bay natural-origin Chinook salmon and coho, respectively. The estimated post-season fishery impact rate for Willapa Bay chum prior to policy adoption was 16.1% in comparison with an average estimate of 5.6% in phase one (Table 3). It is important to note that post-season fishery impact rates during policy implementation years have been affected by in-season adaptive management in the form of emergency regulations. More discussion of emergency regulations in relation to attainment of conservation objectives will be discussed in section 4.6.

Table 3. Estimated post-season aggregate Willapa Bay salmon impact rates. Rates for Chinook salmon and coho are for natural-origin fish.

Year	Chinook	Coho	Chum
2011	24.6%	43.5%	4.2%
2012	42.2%	45.6%	38.1%
2013	28.1%	28.7%	9.6%
2014	57.2%	34.5%	12.4%
Avg. 11-14	***38.0%***	***38.1%***	***16.1%***
2015	22.2%	25.5%	6.8%
2016	21.5%	23.2%	6.6%
2017	14.5%	33.2%	2.8%
2018	8.1%	29.2%	6.4%
Avg. 15-18	***16.6%***	***27.8%***	***5.6%***

The Willapa Bay natural origin Chinook salmon spawning escapement estimate averaged 2,248 fish in the four years prior to policy adoption. Since policy adoption, the phase one average natural origin spawner escapement estimate is 2,363 fish. For natural origin coho, the pre-policy average estimate was 28,749

fish compared to 13,869 fish during policy implementation. Chum estimated escapement averaged 35,134 fish pre-policy compared to 45,411 fish during policy implementation (Table 4 and Figure 8).

Table 4. Estimated post-season aggregate spawning escapements for Willapa Bay salmon from 2011-2018. Chinook salmon and coho are natural origin fish values.

Year	Chinook	Coho	Chum
	obj = 4,353	**obj = 13,600**	**obj = 35,400**
2011	3,331	27,108	65,764
2012	2,057	18,648	25,519
2013	1,669	22,480	23,642
2014	1,936	46,760	25,612
Avg. 11-14	***2,248***	***28,749***	***35,134***
2015	2,043	10,366	44,147
2016	1,580	24,950	78,725
2017	3,008	8,750	20,191
2018	2,821	11,408	38,582
Avg. 15-18	***2,363***	***13,869***	***45,411***

4.1.2 Commissioner's Emphasis Question #2:

What populations of salmon were in need of restoration during the four years prior to Policy adoption and what is their current status?

During policy development, increasing the conservation focus of fisheries management in order to restore salmon population within Willapa Bay was focused on Chinook salmon and chum stocks. Policy language during development was driven by the lack of consistently attaining spawner escapement goals for these two species. For the years leading up to policy development, 1980-2014, Willapa Bay natural origin Chinook salmon and Willapa Bay chum had a success rate of achieving their spawner escapement objective of 11% and 34%, respectively (Figures 2 and 4). Since policy implementation, Willapa Bay chum have achieved the spawner escapement objective three out of four years (75%), while Willapa Bay natural origin Chinook salmon have not yet reached the aggregate escapement goal (Table 4). While increased conservation measures for Willapa Bay natural origin coho were not put in place considering their history of attaining natural origin spawning escapement objectives (89% of the time) leading up to

policy development. Currently, Willapa Bay natural origin coho have failed to reach the spawner escapement objective in three out of four years (Table 4).

4.1.3 Commissioner's Emphasis Question #3:
What is the pattern of abundance for all areas in the ESU of each species in the 20 years prior to Policy adoption and has that pattern changed as a result of Policy C-3622 implementation?

Willapa Bay natural Chinook populations are included in the Washington Coast evolutionary significant unit (ESU). The Washington Coast Chinook salmon ESU includes natural populations of Chinook from the Quillayute River basin in the north to the Willapa Bay basin in the south. A status review of natural Chinook populations from this ESU was conducted by National Oceanic Atmospheric Administration (NOAA) in 1998. Natural Chinook populations in this ESU were found to not warrant protection under the ESA in this review (Myers, 1998). Across all the stocks that comprise the Washington Coast Chinook ESU, Willapa Bay has the lowest number of natural spawners relative to the spawning goal at 52%. From 1995 to 2014, eleven of the natural Chinook stocks within the ESU, that had available data, six of those stocks had numbers of spawning fish above their respective escapement goals. While the number of stocks above their escapement goal has remained stable at six since 2015 eight out of the eleven stocks have shown a negative trend in spawner abundance relative to their spawning goal in the last five years. The Hoko fall and the Queets spring /summer populations have shown improvement in the five most recent years with 105- and a 19- percentage point increase respectively relative to the twenty-year period prior to policy adoption (Table 5).

Table 5. Geometric mean of spawning escapements estimates for natural populations of Chinook within the Southwest Washington ESU from 1995 to 2018.

Chinook Stock	Spawning Escapement Goal	Geometric Mean 1995-2014	% of Goal 1995-2014	Geometric Mean 2015-2019	% of Goal 2015-2019	% Difference (percentage points)
Hoko Fall	850	310	37%	1,204	142%	105%
Quillayute Spring/Summer	1,200	885	74%	945	79%	5%
Quillayute Fall	3,000	4,547	152%	4,192	140%	-12%
Hoh Spring/Summer	900	1,032	115%	997	111%	-4%
Hoh Fall	1,200	2,242	187%	2,132	178%	-9%
Queets Spring/Summer	700	427	61%	563	80%	19%
Queets Fall	2,500	3,222	129%	3,199	128%	-1%
Humptulips Fall	3,573	2,865	80%	2,795	78%	-2%
Chehalis Spring	1,400	2,119	151%	1,066	76%	-75%
Chehalis Fall	9,753	10,816	111%	10,115	104%	-7%
Willapa Fall	4,353	2,329	54%	2,275	52%	-2%

Table 6. Geometric mean of estimates of spawning escapements for natural populations of coho within the Southwest Washington ESU from 1995 to 2018.

Coho Stock	Spawning Escapement Goal	Geometric Mean 1995-2014	% of Goal 1995-2014	Geometric Mean 2015-2018	% of Goal 2015-2018	% Difference (percentage points)
Grays Harbor Fall	35,400	42,646	120%	28,083	79%	-41%
Willapa Bay Fall	13,600	23,472	173%	12,658	93%	-80%

Willapa Bay natural coho populations are included in the Southwest Washington coastal evolutionary significant unit (ESU). Natural populations of coho in this ESU include fish originating from the Willapa Bay and Grays Harbor watersheds, as well as other coastal coho stocks originating from watersheds south of Point Grenville. This would include natural coho populations from the Copalis and Moclips rivers. A status review of natural coho populations from Washington, Oregon, and California was conducted by NOAA in 1995. The coho population in the Southwest Washington ESU were found to not warrant protection under the ESA in this review (Weitkamp,1995). From 1995 to 2014, the two major natural coho populations that comprise this ESU had consistently achieved their natural spawning escapement objectives with the geometric mean of natural spawning escapement estimates of 120% and 173% of their respective goals for the Grays Harbor fall coho and Willapa Bay fall coho, respectively, during that timeframe. Most recently, between 2015 to 2018, that trend has reversed for Grays Harbor and Willapa Bay fall coho stocks. Average spawning escapement estimates during these recent years are 79% for Grays Harbor and 93% for Willapa Bay of their respective spawning escapement objectives. This represents a decline of 41 and 80 percentage points (Table 6) compared to the average spawning escapement estimates relative to the objective. Run reconstruction data for natural coho populations in the Copalis and Moclips rivers are not available.

Table 7. Geometric mean of estimates of spawning escapements for natural populations of chum within the Southwest Washington ESU from 1995 to 2018.

Chum Stock	Spawning Escapement Goal	Geometric Mean 1995-2014	% of Goal 1995-2014	Geometric Mean 2015-2018	% of Goal 2015-2018	% Difference (percentage points)
Grays Harbor Fall	21,000	17,288	82%	32,535	155%	73%
Willapa Bay Fall	35,600	27,517	77%	40,520	114%	37%

Willapa Bay natural chum populations are included in the Pacific Coast ESU. Natural populations of chum in this ESU include fish originating from the Pacific coasts of Washington and Oregon, as well as populations in the Strait of Juan de Fuca west of the Elwha River. A status review of natural chum populations from the Pacific Coast ESU was conducted by NOAA in 1998. Chum populations in this ESU were found to not warrant protection under the ESA in this review (NOAA Federal Register, 1998). From 1995 to 2014, the two major natural chum populations that comprise this ESU had consistently not

achieved their natural spawning escapement objectives with the geometric mean of natural spawning escapement estimates of 82% and 77% of their respective goals for the Grays Harbor fall chum and Willapa Bay fall chum, respectively, during that timeframe. Most recently, between 2015 to 2018, that trend has shown improvement for Grays Harbor and Willapa Bay fall chum stocks. Average spawning escapement estimates during these recent years are 155% for Grays Harbor and 114% for Willapa Bay of their respective spawning escapement objectives. This represents an increase of 73 and 37 percentage points compared to the average spawning escapement estimates relative to the objective (Table 7). Run reconstruction data and estimates of the natural spawning populations for chum that make up the remainder of the stocks within the Pacific Coast ESU are not available.

4.2 Monitoring, Sampling, and Enforcement Programs

Policy Citation – Guiding Principle #7: *Monitoring, sampling, and enforcement programs will adequately account for species and population impacts (landed catch and incidental fishing mortality) of all recreational and commercial fisheries and ensure compliance with state regulations. Develop and implement enhanced enforcement strategies to improve compliance with fishing regulations and ensure orderly fisheries.*

Prior to implementation of Policy C-3622, fisheries monitoring, and sampling programs conducted on terminal fisheries (recreational and commercial) within Willapa Bay were limited in nature. Monitoring programs for recreational fisheries in both the freshwater and marine environments relied solely upon estimates of catch generated by the Catch Record Card system (CRC). These CRC estimates do not provide estimates of impacts to non-retained species accrued in mark-selective fisheries. Also, CRC estimates are generated post-season and can have a 12-18-month lag in generation of estimates not allowing their use for in-season management. Commercial fisheries monitoring programs within Willapa Bay relied upon sampling of harvest and had limited data to account for release mortality impacts accrued as a function of mark-selective fisheries.

Since Policy implementation, the Department has monitored recreational fisheries prosecuted in the terminal marine waters. In the initial years, 2015-2017, this program was designed to gather data relevant to total encounters of all species during the fishery as well as data on stock, origin, and age composition and increased collection of coded wire tags (CWT's). This program consists of creel samplers interviewing anglers as well as a "volunteer trip report" program (VTR), where anglers are provided with the ability to send in their completed trip data to the Department. In 2018, with increased funding, the Department was able to implement a more robust marine recreational monitoring program, which now includes in-season estimates of effort and harvest/impacts in combination with the encounter and stock/age composition data. Table 8 shows the number of anglers interviewed both dockside and through the VTR program annually. Freshwater fisheries prosecuted in Willapa Bay are still monitored utilizing the CRC system.

Table 8. The number of interviews and anglers sampled from Willapa Bay Recreational Marine Area 2.1 monitoring program from 2015-2018.

Year	Number of Dockside Interviews	Number of Anglers Sampled	Number of VTRs Collected	Number of Anglers in VTRs
2015	285	708	72	136
2016	1,414	3,348	73	168
2017	885	2,046	34	81
2018	1,950	4,549	18	42

As mentioned above, monitoring and sampling programs provide staff with stock, age, and species composition data but lacked significant information as to impacts to non-retained species resulting from mark-selective fisheries. Biological sampling of the commercial harvest is conducted on 20% of the total Chinook salmon and coho harvest and 10% of the total chum harvest but on-board observation rates used to generate encounter and impact estimates were typically less than a 2% sample rate. During policy development, significant investment was made to increase the on-board observation rate with the objective of on-board monitoring at a rate of 15% of the total commercial landings annually. Table 9 shows the total number of commercial landings and the number of on-board observations conducted annually from 2014-2018.

Table 9. The number of total commercial landings and on-board observations conducted within Willapa Bay from 2014-2018.

Year	# of Commercial Landings	# of On-Board observations	Sample Rate
2014	1402	65	4.60%
2015	261	75	28.70%
2016	657	95	14.50%
2017	344	68	19.80%
2018	339	92	27.10%

The department has increased the coverage of spawning ground surveys conducted for Chinook salmon and coho. This work relies on float and foot surveys of small reaches of spawning areas that represent the basin. These are referred to as index and supplemental survey areas. Indexes are a section of stream surveyed every 7-10 days. A supplemental survey is a section of river walked in addition to the index or "standard" reach surveyed, but only conducted once during peak spawning time. Supplemental surveys provide information on spawning distribution in the watershed and provide additional information on abundance relative to previous years data in these reaches. To increase monitoring efforts within Willapa Bay consistent with policy guidance, the agency added three scientific technicians and one lead fish biologist to the Willapa Bay stock assessment team in 2016. Further discussion of stock assessment and spawning ground survey activities for Chinook salmon and coho will described in sections 5.6 Chinook salmon and 6.5 coho.

4.3 Improved Fishery Management and Technical Tools

Policy Citation – Guiding Principle #10: *Seek to improve fishery management and technical tools through improved fishery monitoring, the development of new tools, and rigorous assessment of fishery models and parameters.*

The implementation of a marine recreational fishery monitoring program coupled with the increased on-board sample rate in the commercial fishery monitoring program have improved the Department's ability to evaluate fisheries with regard to conservation and management objectives. This provides the Department the ability to adaptively manage the fisheries in-season based on fishery performance and total number of impacts accumulated in comparison to predictions developed during the pre-season fishery planning process. Lastly, the increased technical rigor of fisheries monitoring has also improved the robustness of estimates of non-landed mortality to natural-origin Chinook salmon as a result of mark selective fisheries.

Pre-season planning of fisheries within Willapa Bay rely heavily on the technical models the Department utilizes to generate estimates of terminal abundance (forecast models) and estimates of harvested and non-harvested mortality associated with prosecution of fisheries (Willapa Bay Terminal Area Management Model, Willapa Bay TAMM). The increased fishery monitoring effort has expanded the Department's ability to account for and estimate the number of non-landed fishing related mortalities resulting from fisheries prosecution. Also, to account for these new sources of information, the models mentioned above went through a rigorous re-design and error-checking effort to increase the precision of predictions. Lastly, regional staff have been developing a series of new technical tools to help refine fishery management actions or for inclusion into the models described above. These tools include; an in-season update model for coho abundance, spawning escapement estimator using historical run-timing information to predict spawner abundance from real time values, genetic analysis of natural-origin

Chinook salmon to assess stock composition in marine area fisheries, and a CWT based analysis used to assess the harvest contribution of hatchery fish to marine area fisheries.

4.3.1 Commissioner's Emphasis Question #14:
With the understanding that department staff as a whole is constantly in a mode of incorporating improvements in technical fishery management capabilities as new approaches or refinements are vetted, even when minor, what are the three most significant advancements in technical fishery management capabilities for Willapa Bay salmon over the course of the Policy to date? If less than three, state any that fit a threshold of reasonably high significance.

The most significant advancement in fishery management capabilities is the active fisheries monitoring of both recreational and commercial marine area fisheries. These programs have provided the Department the ability to estimate harvest and impacts in-season, and to make in-season, adaptive management adjustments to fishery schedules in order to meet conservation and management objectives outlined in the Policy. Secondly, the development of an in-season update model for coho based on catch per unit effort (CPUE) in the commercial fishery furthers the Departments ability to apply adaptive management principles to meet policy management objectives. Lastly, the CWT based analysis of hatchery contribution to marine area harvest will allow for better accuracy in targeting hatchery fish in both space and time. CWT programs within Willapa hatcheries were re-designed in 2016 for Chinook salmon to ensure representative tag groups were produced from all three facilities.

4.4 Mark-Selective Fisheries (MSF)

Policy Citation – Guiding Principle #11: *When a mark-selective fishery occurs, the mark selective fishery shall be implemented, monitored, and enforced in a manner to achieve the anticipated conservation benefits.*

As discussed in the background section of this report, the ability to utilize mark-selective fisheries within Willapa Bay is a relatively recent development. Mass marking of Chinook salmon and coho hatchery production from Willapa Bay hatchery facilities began with the 2006 and 1996 brood year, respectively. Prior to policy development, recreational and commercial fisheries within Willapa Bay were implemented as mark-selective fisheries. Recreational marine and freshwater fisheries as well as commercial fisheries required the release of natural origin Chinook salmon beginning in the 2010 fishery year.

To enhance recreational fishing opportunity for Chinook salmon, additional mark-selective recreational fisheries were opened for directed Chinook salmon opportunity in sections of rivers traditionally closed prior to 2015. The river systems that were opened for mark-selective Chinook salmon opportunity include rivers with hatcheries located within the basin; Naselle River, North Nemah River, and Willapa River. River sections below and/or adjacent to the hatchery were traditionally closed to allow for broodstock collection as well as enforcement issues. Based on historical run timing information these sections of river would open to provide coho opportunity, typically October 1st. Since policy implementation, these river sections have been opened beginning August 1st for freshwater recreational directed Chinook salmon fishing. While opening these sections of river for Chinook salmon opportunity has increased the overall freshwater catch of Chinook salmon, issues involving trespass, garbage, snagging, and targeting of females resulting in wastage have been documented.

4.4.1 Commissioner's Emphasis Question #9:
What mark-selective fisheries have been implemented since Policy adoption that were not in place prior to Policy adoption?

Sections of rivers directly below and/or adjacent to hatcheries within the Naselle River, North Nemah River, and Willapa River have been opened for freshwater recreational mark-selective directed Chinook salmon fishing.

4.4.2 Commissioner's Emphasis Question #15:
With cross reference to question 9, what has been the conservation benefit from mark-selective fisheries newly implemented as a result of this Policy, and how do they compare to the benefits anticipated when the new fishery regulations were set?

The opening of these mark-selective freshwater fisheries has increased the overall catch of Chinook salmon by freshwater anglers and contributed to the overall conservation benefit by increased removal of hatchery fish prior naturally spawning. Unfortunately, the Department does not have the resolution in freshwater fisheries data to measure catch/impacts in single sections of river.

4.5 Investigate and Promote Alternative Gear

Policy Citation – Guiding Principle #4: *Investigate and promote the development and implementation of alternative selective gear. The development of alternative gear may provide an opportunity to target fishery harvests on abundant hatchery fish stocks, reduce the number of hatchery-origin fish in natural spawning areas, limit mortalities on non-target species and stocks, and provide commercial fishing opportunities.*

Alternative gear for use in commercial fisheries within Willapa Bay is defined in Policy C-3622 as having an anticipated release mortality of less than 35%. The Department utilizes release mortality rate recommendations provided by an independent fishery science panel for use in pre-season fishery planning. The release mortality rate recommendations developed by the panel are based on a literature review of release mortalities and the historical rate of compliance within the fishery. For Willapa Bay, commercial fisheries release mortality rate recommendations were 56% for small mesh gill net, defined as having a mesh size of no more than 6 ½ inches, and 31% for tangle nets, defined as having a mesh size of 4 ¼ inches maximum. Given the recommended release mortality rate as well as the definition of alternative gear in the Policy, tangle nets meet the criteria for use as alternative gears.

Table 10. Mark-selective commercial fishing gear set aside by fishery (2015-2018).

Fishing Year	Alternative gear set-aside
2015	1%
2016	2%
2017	6%
2018	6%

The Policy further incentivizes the use of alternative gear in commercial fisheries by setting aside a portion of the 20% harvest rate cap on natural-origin Chinook salmon to only be accrued using alternative gear (Table 10). Lacking development of any additional alternative gears, the use of tangle nets was identified during the pre-season fishery planning process as the only gear type currently available that meets the alternative gear definition in the Policy. Commercial fisheries were planned such as to utilize tangle nets during times when encounters of natural-origin Chinook salmon were most likely. While fisheries were scheduled such as the predicted impacts to Willapa and Naselle River natural-origin Chinook salmon utilizing alternative gear would meet policy objectives, only Willapa River met that objective in all years based on post-season estimates (Table 11). Post-season estimates of impacts accrued

utilizing alternative gear for the Naselle River natural-origin Chinook salmon stock were negatively affected by in-season adjustments to commercial schedules. Also tangle nets appear to have a lower catch efficiency than gill nets when fished in the more open areas of the bay, such as 2N and 2T, as compared to their use in the more terminal commercial catch areas such as 2U and 2M. This lower catch efficiency would lead to overestimates of catch in preseason fishery planning models based upon historical harvest rates used from small mesh gill net fisheries.

Table 11. The predicted and actual estimates of Willapa River and Naselle River natural-origin Chinook salmon impacts accrued in commercial fisheries by fishery (2015-2017).

Year	Willapa River		Naselle River	
	Predicted	Actual	Predicted	Actual
2015	6.5%	2.5%	1.1%	0.4%
2016	6.8%	2.6%	11.0%	2.7%
2017	6.0%	8.4%	11.9%	4.7%

4.5.1 Commissioner's Emphasis Question #20:
Were the 2017 report and the 2018 assessment of options completed and if so, what are the highlights of the reports? The links to these reports should be included in the analysis.

The report and assessment of options were not completed. Prior to the 2015 and 2016 fishery seasons, the Department sent out a call for proposals for alternative gear types that might be tested within Willapa Bay, but the response was limited. One proposal, a floating pontoon fish trap, was put forth, a process was identified, and a formal rule making process was started to test its use in Willapa Bay. However, feedback received at public meetings showed the proposal did not have support from any of the fishery sectors. The use of tangle nets has been the only alternative gear type that has been utilized to meet policy objectives.

4.5.2 Commissioner's Emphasis Question #24:
What were the actual annual pre-season planned impact rate set-asides for mark selective commercial fishing gear and what were the actual post-season impact rates that occurred, over the course of 2105-18, in comparison to the set-asides called for in the Policy?

The pre-season prediction and post-season estimates of natural-origin Chinook salmon impacts for Willapa and Naselle River stocks are described in Table 11.

4.6 In-Season Management Actions

Policy Citation – Guiding Principle #8: *If it becomes apparent that a scheduled fishery will exceed the aggregated pre-season natural-origin Chinook salmon mortality (impact) expectation, the Department shall implement in-season management actions in an effort to avoid cumulative mortalities of natural-origin Chinook salmon in excess of the aggregated pre-season projection.*

In the Adaptive Management section of the Willapa Bay Salmon Management Policy, C-3622, it states, "*Department staff may implement actions to manage adaptively to achieve the objectives of this policy and will coordinate with the Commission, as needed, in order to implement corrective actions*." It also states to, "*Improve In-Season Management: The Department shall develop, evaluate, and implement fishery management models, procedures, and management measures that are projected to enhance the effectiveness of fishery management relative to management based on preseason predictions*."

Per policy guidance, Department staff developed different tools to better inform fisheries management in Willapa Bay. These tools are discussed further in Section 4.3; *Improved Fishery Management and*

Technical Tools. These tools include implementation of active terminal marine recreational fishery monitoring, increased commercial on-board fishery monitoring, an in-season update model for coho abundance using historical and current commercial data, spawning escapement estimators for Chinook salmon, coho and chum using current and historical redd data, CWT analysis to assess harvest contribution of hatchery fish to the recreational marine area and commercial fisheries, and genetic analysis of natural origin Chinook salmon. Other data used in conjunction with the above tools are hatchery rack information and historical CRC data for recreational fisheries. The extensive list of in-season tools the department has developed since policy implementation has significantly increased and improved our ability to make informative management decisions that was previously unavailable.

Table 12. In-season management actions 2015-2018.

Year	Fishery Affected	In-season Action	Reason for Action
2015	Commercial	Emergency regulations closing and opening fishery	Chinook salmon
	Commercial	2 test fishing days in one area	Chinook salmon
	Recreational	Closure in November, except 4 systems	Coho
2016	Commercial	Emergency regulations for November	Chum
2017	Recreational	Freshwater bag limit reduction	Coho
	Commercial	Emergency regulations for recovery box use for chum	Chum
2018	Recreational	Emergency regulations closing and opening fisheries	Chinook salmon
	Commercial	Emergency regulations closing and opening fishery	Chinook salmon

In order to maintain the conservation and management objectives outlined in the Policy C-3622 Department staff took several in-season actions (Table 12). In-season actions taken by the Department since policy implementation were generally due to harvest exceeding preseason expectations based on the Willapa Bay TAMM or run size expectations were below preseason forecasts.

In 2015, the Department was concerned with the unmarked Chinook salmon impacts being higher than predicted preseason during the commercial fishery. In season options were discussed with the WBSAG. This resulted in the addition of test fishing days to further assess stock composition of unmarked Chinook salmon impacts. Fisheries managers continued to observe higher than predicted unmarked Chinook salmon impacts by the commercial fishery, and therefore, additional closures were necessary. Once the Department observed the impacts to the unmarked Chinook salmon were subsiding, the Department addressed the natural coho impacts. Department staff reported the current coho run sizes appeared to be below preseason forecasts. Therefore, adjustments were made to both the marine and freshwater recreational fisheries by closing all salmon fishing, except for certain sections of four systems within Willapa Bay. Even though the Department made several in-season adjustments to its fisheries, both Chinook salmon and coho escapements failed to meet their goal in 2015 (Table 13).

No in-season actions were necessary for Willapa Bay fisheries in August, September, and October for the 2016 season. These fisheries were conducted as planned preseason. By November of this season, the commercial harvest of chum was beginning to exceed preseason expectations based on the Willapa Bay TAMM model. The Department met and discussed options with the WBSAG, and it was determined a

modification was necessary in order to meet chum conservation objectives outlined in Policy C-3622. As a result of those discussions, the Department closed commercial salmon fishing in early November. Department staff re-evaluated the status of the chum returns using spawning ground survey data and the in-season update model described in Section 4.3. These data indicated the chum return was higher than the preseason forecast. As a result, the Department re-opened the commercial salmon fishery in November for an additional eight days. The in-season management action the Department used in the commercial fishery helped ensure the conservation and management objectives for chum would be achieved.

In-season action was necessary to address the coho and chum fishery in 2017. Commercial fisheries throughout Willapa Bay are required to hold their catch in a recovery box during mark selective fisheries to minimize encounters and release mortality on non-targeted species. In addition, the commercial rulemaking package filed in the CR-103P, prohibited the retention of chum and required this species to be placed in the recovery box prior to release. Recovery boxes provide oxygenated water, which helps to reduce the effects of capture and stress (fatigue, physical damage, and/or asphyxiation) on non-targeted species. In October, the Department observed high chum densities that were likely to overwhelm the recovery box, and therefore acted to lift the restriction that all chum must be placed in the recovery box prior to release. The chum run size was then re-evaluated using the in-season update model described in further detail in section 4.3. Department staff concluded that overcrowding of the recovery box by chum was no longer applicable and repealed the previous action. The Department then focused resources on the coho returns. The Department acted in early January 2018, by reducing the total salmon adult bag limit from two fish to one fish in the recreational freshwater and marine fisheries and required the release of wild coho for the remainder of the scheduled recreational fishing season. Even with these in-season management adjustments, coho and chum escapements failed to meet their goals in 2017 (Table 13).

In 2018, the Department took in-season action to address fall Chinook salmon. The Chinook salmon run size appeared to be below preseason expectations, after evaluation of harvest and impacts compared to those predicted preseason. The overall impacts from the recreational and commercial fishery were lower than predicted preseason. Department staff utilized in-season management tools to better inform the data such as on-board commercial fishing data and current ocean harvest data. Therefore, the Department acted in mid-September to curtail Chinook salmon impacts by closing all commercial and recreational fisheries. Fall Chinook salmon returning to the tributaries in Willapa Bay were significantly lower than preseason predictions in the commercial and recreational fisheries and hatchery returns were lower than necessary to meet egg take goals. A week later, historical run-timing and stock composition data suggested minimal fall Chinook salmon encounters were likely to occur in the terminal marine and specific commercial area fisheries. Thus, the Department acted to re-open marine area 2-1 and required the release of all Chinook salmon. In addition to this, the Department re-opened a limited commercial fishery to target coho and chum, as directed in the Policy C-3622. In early October, all freshwater systems, except Naselle River, re-opened to salmon fishing and required the release of all Chinook salmon. There were also some limited commercial fisheries allowed. Finally, by mid-October, the Department acted to re-open salmon fishing in the Naselle River with similar rules as other freshwater systems within Willapa Bay (Table 12).

Table 13. Willapa Bay Natural Origin Spawner (NOS) Escapement Estimates (2015-2018).

Year	NOS Chinook	NOS Coho	Willapa Bay Chum
Esc Goal	**4,353**	**13,600**	**35,400**
2015	2,824	10,790	45,325
2016	1,887	25,290	80,931
2017	3,078	9,091	21,986
2018	2,853	11,603	41,448
Average	**2,661**	**14,194**	**47,423**

4.7 Transparency of Salmon Management

Policy Citation – Guiding Principle #9: *Salmon management and catch accounting will be timely, well documented, transparent, well-communicated, and accountable. The Department shall strive to make ongoing improvements in the transparency of fishery management and for effective public involvement in planning Willapa Bay salmon fisheries, including rule-making processes. These shall include: a) clearly describing management objectives in a document available to the public prior to the initiation of the preseason planning process; b) enhancing opportunities for public engagement during the preseason fishery planning process; c) communicating in-season information and management actions to advisors and the public; and d) striving to improve communication with the public regarding co-management issues that are under discussion.*

The Department values public feedback and input during the pre-season fishery planning process in order to shape and scope fishery packages to provide harvest opportunity within the conservation and management objectives. In order to facilitate public input during the Willapa Bay planning process, the Department schedules multiple public meetings, WBSAG meetings, a public hearing as described in the Administrative Procedures Act (APA) to directly provide comments on proposed fishery regulations, and the ability to provide comments through the WDFW website. Typically, Willapa Bay planning consists of two to three public meetings, two to three WBSAG meetings, and three public hearings (one for each corresponding Washington Administrative Code (WAC); Willapa Bay Commercial WAC, Coastal Marine Recreational WAC, and Coastal Freshwater Recreational WAC). Discussion at these meetings include forecasts, management and conservation objectives, fishery proposals submitted by the public, and co-management concerns. Lastly, the Department has increased the utilization of the WBSAG webpage, by providing meeting handouts, audio recording of meetings, and notes from the meetings, to increase the information sharing and public involvement in the Willapa Bay pre-season fishery planning process.

The Department has also taken steps to implement increased information sharing and transparency regarding in-season monitoring and attainment of conservation and management objectives. Harvest information from commercial and recreational fishery monitoring programs are posted on the agency's website. Also, regional staff have developed a weekly mailer that is sent out to constituents who have provided their e-mail address at pre-season planning or other meetings. The weekly mailer includes in-season estimates of harvest and impacts from marine area fisheries (recreational and commercial) in relation to the predicted pre-season values and a brief summary of the fishery in terms of effort and other relevant factors (i.e. tidal schedules, weather forecasts, etc.). The mailer also summarizes hatchery information in terms of recruits to the facility and their disposition as well as information relevant to

attainment of hatchery production goals. Lastly, the agency has begun the practice of initiating conference calls with the WBSAG to take feedback and input as to in-season adaptive management changes to fishery schedules, if attainment of conservation or management objectives might be in jeopardy.

4.8 Implement Improved Broodstock Management

Policy Citation – Guiding Principle #3: *Implement improved broodstock management (including selective removal of hatchery fish) to reduce the genetic and ecological impacts of hatchery fish and improve the fitness and viability of salmon produced from Willapa Bay rivers (see Hatchery and Fishery Reform Policy C-3619). Achieve Hatchery Scientific Review Group (HSRG) broodstock management standards for Coho and Chum salmon by 2015, and work toward a goal of achieving standards for Chinook salmon by 2020.*

The Hatchery Reform Project was funded by the US Congress in 2000. The project was in response to the recognition that while hatcheries play an important role in providing harvest opportunity, achievement of conservation goals were rarely being met. An independent scientific review panel, Hatchery Scientific Review Group (HSRG), was established to review all state, tribal, and federal hatchery programs including coastal Washington. The objective of the HSRG was to provide a systematic, science-driven review of hatchery programs, which would provide scientific defensibility and data necessary for informed decision-making regarding hatchery programs in order to further conservation of naturally spawning populations and to support sustainable fisheries. HSRG recommendations for Puget Sound and coastal Washington were published in 2004. The Commission adopted a Hatchery and Fishery Reform Policy C-3619 in 2009, consistent with implementation of HSRG recommendations on a statewide basis. Policy C-3619 is currently undergoing a Commission directed comprehensive review and some elements of the Policy have been suspended pending the outcome of the review.

A couple of the key priorities established for implementation of hatchery reform principles rely on classification of hatchery programs within two categories; broodstock management and population designations. Broodstock management classifications are defined based upon the purpose and strategy of the program and described in three categories; integrated, segregated, and stepping-stone. Integrated programs utilize both hatchery and natural origin adults as broodstock and are designed to minimize genetic separation between hatchery and natural origin fish. Segregated programs utilize hatchery origin fish as broodstock and are designed to create genetically distinct populations. Stepping-stone programs can be used as an initial step in achieving an integrated program when the number of natural origin adults are not available to meet program requirements. Stepping-stone programs can transition to integrated programs as natural origin abundance increases. Population designations are a measure of the biological significance of a population to the recovery of the ESU. The three types of population designations are primary, contributing, and stabilizing. Primary populations can be described as having a high biological significance to the recovery of the ESU, historically were a large segment of the population structure and at a low risk of extinction. Contributing populations have some significance to the recovery of the ESU but are lower in abundance than primary populations and contribute to the diversity of the population. Stabilizing populations provide the lowest significance to recovery of the ESU and may not have ever been a large segment of the ESU population structure (LCRFB, 2010).

Based upon the Ford (2002) model, HSRG has developed metrics to evaluate hatchery programs in relation to their broodstock management strategy and population designation. The proportionate natural influence (PNI) is the primary metric developed to measure gene flow within the population and can be calculated as:

$$PNI = pNOB/ (pNOB + pHOS)$$

Where pNOB is defined as the proportion of natural-origin adults in the hatchery broodstock and pHOS is the proportion of hatchery-origin fish on the spawning grounds. As mentioned above, PNI is a measure of gene flow between the hatchery and natural environments and is measured on a scale of 0-1. Populations having a PNI of >.5 denotes the natural environment as driving adaptation and <.5, the hatchery environment is driving population genetics. Guidelines have been established for pHOS and PNI in relation to the population's designation and broodstock management strategy are as follows:

Primary populations - Integrated hatchery programs - PNI $\geq$ 0.67; pHOS $\leq$30%
Segregated hatchery programs - pHOS < 5%

Contributing populations - Integrated hatchery programs - PNI $\geq$ 0.50; pHOS $\leq$30%
Segregated hatchery programs - pHOS < 10%

Stabilizing populations - Integrated hatchery programs - current condition
Segregated hatchery programs - current condition

Appleby (2014) provided a report with an update on the science of hatcheries. As part of this report, HSRG developed the phases of recovery, however this concept was not fully adopted until after the implementation of the Willapa Bay Policy and as such, the concepts were not adopted in the Policy. This concept, however, was adopted statewide by WDFW under the Hatchery and Fishery Reform Policy. This approach takes the conservation status of the natural population into account when applying HSRG broodstock management standards. The phases of recovery are as follows:

Preservation: The priorities during this phase are to prevent extinction, retain genetic diversity and identity of the existing population, increase abundance and restore habitat. Broodstock management standards for integrated programs do not apply.

Recolonization: The priorities during this phase are to re-populate restored and/ or depleted habitat, increase abundance and temporal and spatial diversity (spawning and rearing) of the population and retain genetic diversity and identity of the existing population. Broodstock management standards for integrated programs do not apply.

Local Adaptation: The priorities during this phase are to meet and exceed minimum viable spawner abundance for natural spawners, increase fitness, reproductive success and life history diversity through local adaptation. Broodstock management standards for integrated programs apply during this phase.

Full Recovery: The priorities during this phase are to maintain a viable population, based on all viable salmonid population (VSP) attributes using long-term adaptive management. Broodstock management standards for integrated programs apply during this phase.

Triggers for moving between the phases should be developed using observed population abundance, productivity and diversity.

The current phase of recovery for each natural population directly impacted by a hatchery programs in Willapa Bay have been identified. All Chinook salmon and chum populations are considered in the local adaptation phase and all coho populations are considered in the full recovery phase. However, these phases are currently considered interim and lack rigorous scientific justification at this time. Currently, the agency has not developed a scientific framework for identifying the phase of recovery that natural populations are in as well as the triggers for transitioning between the phases of recovery. As such, Willapa Bay populations also lack triggers for moving between phases at this time.

4.8.1 Commissioner's Emphasis Question #11:

Are there HGMP's for the hatcheries in the Willapa Bay Basin? If so, insert a link in the analysis.

There are currently no Hatchery Genetic Management Plans that have been submitted or developed for hatchery programs in the Willapa Bay Basin.

4.8.2 Commissioner's Emphasis Question #12:
What are the specific wild broodstock management standards for coho and chum salmon that are referred to, and were they achieved by 2015? If not by then, have they been achieved since 2015? If not, what progress was made of the course of 2015-18 in comparison to a base period prior to Policy adoption?

The specific broodstock management standards for coho and chum hatchery programs is included in sections 5.1 and 6.1, respectively. Detailed discussion of whether those standards have been achieved and the progress working towards achieving the standards is included as well.

4.9 Protect and Restore Habitat Productivity

Policy Citation – Guiding Principle #2: *Work with our partners (including Regional Fishery Enhancement Groups, nonprofit organizations, the public and Lead Entities) to protect and restore habitat productivity.*

Since establishment of the Policy, there has been regional leadership, cross-agency coordination and extensive coordination with local salmon recovery groups in order to protect and restore salmon habitat. The mission of the habitat program is: *"To protect and restore regional fish and wildlife populations and their habitats by preserving, restoring, and protecting ecosystem function and ecological connectivity, and educating citizens on the importance of our natural resources."* The habitat program works to protect fish life through the enforcement of the hydraulic code, Chapter 220-660 WAC. Within the hydraulic code, the program issues hydraulic project approvals (HPAs) to ensure projects are performed properly, fish life is protected, and negative impacts are mitigated. The program also protects and conserves through water typing streams, preserving fish habitat, serving on local Lead Entities' Technical Advisory Groups, identifying potential restoration or preservation opportunities for fish and to identify and aid in the removal of fish barriers.

Collaboration with sister agencies, tribes, and local groups are essential to accomplish many of the restoration and conservation goals set forth by the WDFW strategic plan. The habitat program consistently collaborates with Department of Natural Resources (DNR), Department of Ecology (ECY), local tribes, and the industrial foresters to protect fish bearing waters and address fish barriers within their forest practice work. Developing and maintaining strong community relationships is a core focus for habitat program. The regional habitat biologist is working to earn the trust of keys players in the Pacific County Marine Resources Committee (PCMRC) and Willapa Bay Lead Entity. Creating a good working relationship with the Regional Fisheries Enhancement Group coordinator has led to several fish enhancement projects being completed and potential collaborations for the future.

Willapa Bay watershed consists of 1,407 linear river miles of potential fish habitat (Phinney, 1975). These rivers flow through industrial timberlands, farms, cities, and under a labyrinth of state, county, and private roads. The water crossings under our roads are essential to salmon for migration but not all crossings allow for passage. Many of our water crossings are considered barriers to fish passage meaning they are undersized, blocked, to steep, or high velocity to effectively allow passage. These can be partial or full barriers but regardless they cause stress to fish and in many cases prevent them from completing their lifecycle. There are at least 321 identified fish passage barriers in Willapa Bay (Figure 9). Many of these barriers are the first water crossings a salmon may encounter moving upstream and are preventing fish from reaching the spawning grounds. The state injunction on Washington State Department of

Transportation (WSDOT) only covers Water Resource Inventory Areas (WRIAs) 1-23, meaning Willapa Bay, WRIA 24, will not have any state-owned barriers addressed until 2030 or later. The local conservation district is working to prioritize the barriers; this has been accomplished through the local Lead Entity group, where a Technical Advisory Group (TAG) and Citizen Committee will determine which projects should be funded. Success with these projects help to fulfill the guiding principles of the Willapa Bay Salmon Management Policy C-3622 and cross-program work has been equally important. WDFW has two members serving on the TAG of the Lead Entity, the regional habitat biologist and the fish stock assessment biologist for Willapa Bay. A fish biologist serving on the Lead Entity TAG is unique, and other members have commented on how much they value the fish biologist's involvement and collaboration. This teamwork between the fish and habitat biologist has been beneficial in other areas as well.

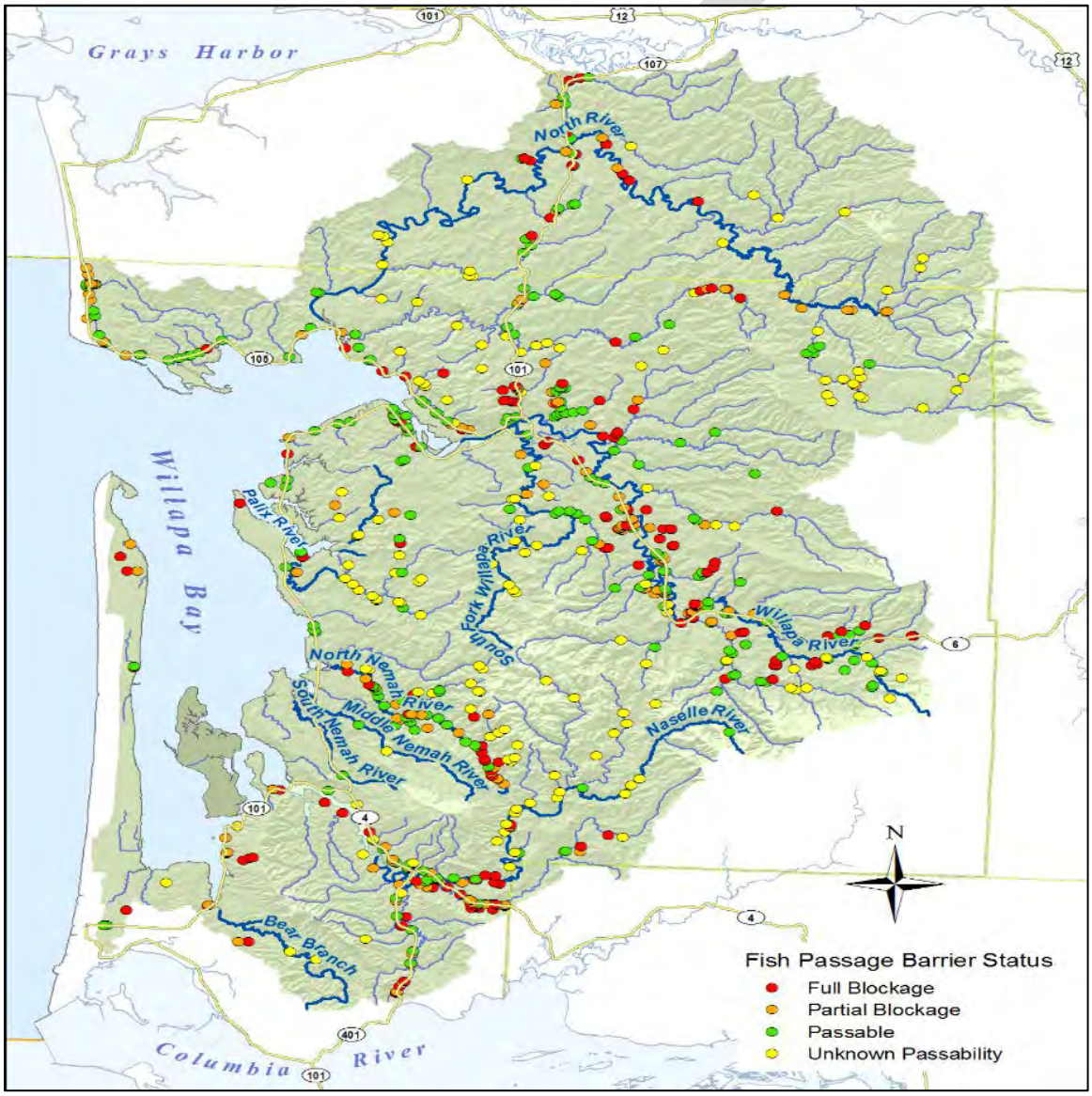


Figure 9. Fish passage barriers in Willapa Bay.

Since the Willapa Bay Salmon Management Policy C-3622 went into effect in 2015, there have been 16 habitat projects funded and a total of $9.7 million invested in habitat restoration work in the Willapa Bay

watersheds. Of these, 14 different projects have addressed fish barriers, and some have been coupled with in-stream or riparian restoration (Figure 10). As noted above, fish barrier corrections are a crucial part of salmon recovery but the focus on restoration is expanding to include habitat. A pilot watershed project on the Middle Fork Nemah River has identified many habitat issues not related to fish passage and is focusing on retaining spawning gravel, reconnecting floodplains and increasing channel complexity. The Pacific County Conservation District and the regional habitat biologist are currently pursuing grant funds to conduct habitat assessments of juvenile rearing within the bay and assessing habitat in the North River tributaries, which has been struggling to meet historical escapement numbers. The regional habitat biologist is also working with the Department's Fish Program and Science Division to secure funding for additional juvenile monitoring projects to address key data gaps associated with salmon resource management. Communication between programs has been crucial to the pursuit of these funds since habitat relies on the expertise of the regional stock assessment team to capture the direction and reasoning for these projects are sound.

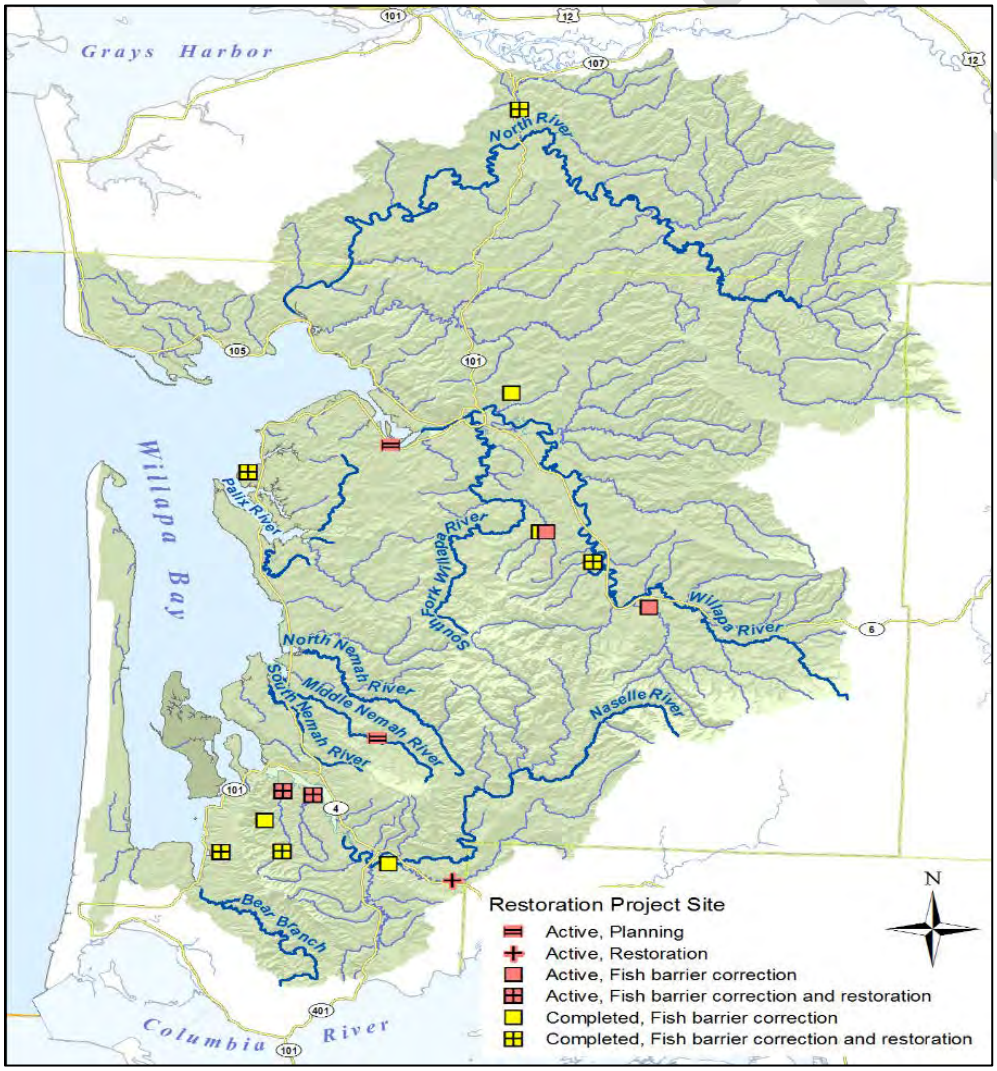


Figure 10. Restoration projects in Willapa Bay (2015-2018).

Denny Creek, a tributary to the North River, is an historical index for spawning ground surveys for coho in Willapa Bay (Figure 11). Up until 2015, Denny Creek had shown strong numbers of fish spawning

until it was identified by staff that there was a “potentially blocked” culvert at the confluence of the stream. This culvert was identified as being partially blocked with sediment therefore, creating a large drop. After two consecutive years of poor salmon returns, the fish program reached out to the habitat program for additional assistance in determining any potential fish barriers or blockages. The presence of a fish blocking barrier was confirmed by the habitat program. The appropriate landowner (a timber company), was contacted and a request to clear the culvert was initiated. Within the week, the culvert was cleared and coho were reported upstream of the culvert and an increase of redds was observed (Figure 12). The collaboration between the fish and habitat programs is just one example of the importance of communication between these two programs. It’s a step that is critical to maintain our salmon runs.

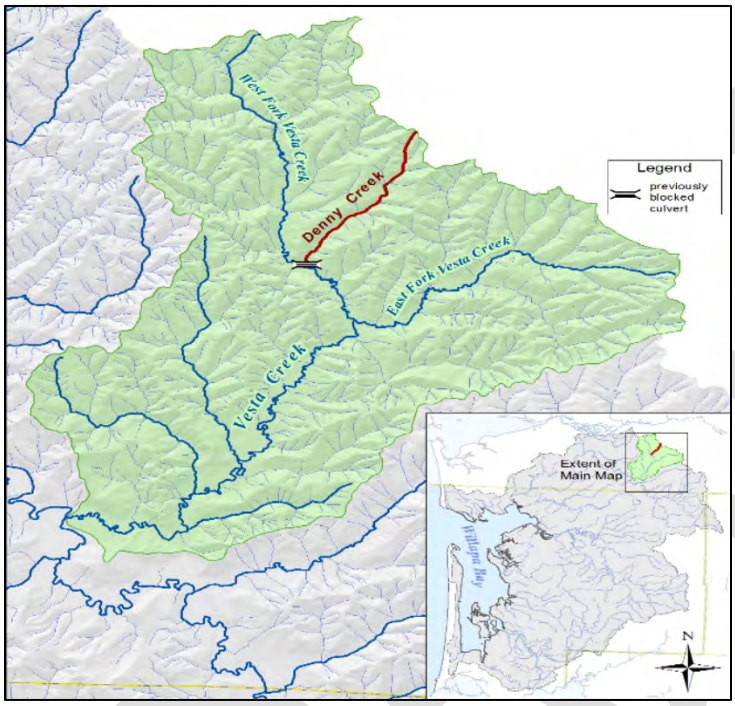


Figure 11. Denny Creek Vicinity Map.

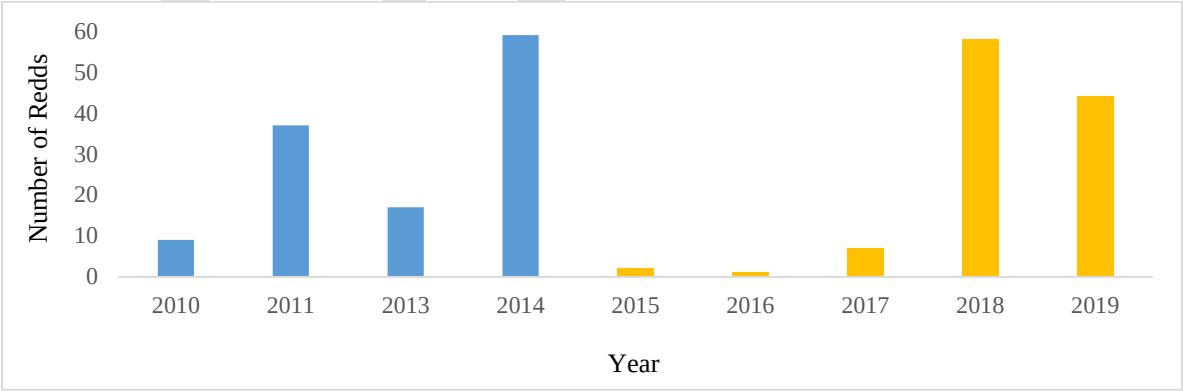


Figure 12. Denny creek redd trends pre policy (blue lines) and during policy (orange lines).

Another example of cross program collaboration and in conjunction with the Coast Salmon Partnership, 54 temperature monitoring devices have been installed throughout the entirety of the Willapa Bay watershed. The project was funded by the Coast Salmon Partnership, while the installation, maintenance, and data has been conducted by the Willapa Bay fish program stock assessment team and the regional habitat biologist. One goal is to identify areas of cooler temperatures during low flow and hot weather conditions during the summer. The data collected could steer barrier removals towards areas fish prefer to use to stay healthy during migration and rearing. These data from Willapa Bay will be added to a larger, region-wide dataset to help monitor and educate temperature models in Western Washington. These data will be important for fish management and recovery moving forward. These additional data are the result of working with our tribal partners and other state and federal agencies to fill gaps in knowledge and effectively spend state funds for restoration.

The agency cross-program work is helping to accomplish the guiding principles in the Willapa Bay Salmon Management Policy C-3622. If habitat and fish program did not work together on the local level, crucial information would be left uncommunicated. It is through the habitat program that many of the biggest protections for fish life are accomplished. Fish program then supplements that knowledge, which is used to inform restoration priorities and areas for conservation. There is still much work to be done to preserve, protect salmon habitat and ensure there are healthy runs to prosecute fisheries. Agency leadership and the Commission's support for district teams, collaboration and communication will be key for our salmon populations moving forward.

4.9.1 Commissioner's Emphasis Question #10:
What habitat restoration projects were implemented after Policy adoption as a result of this Policy?

Detailed discussion of habitat restoration projects in Willapa Bay are detailed above in section 4.9.

4.10 Work with PSC and PFMC

Policy Citation – Guiding Principle #5: *Work through the Pacific Salmon Commission to promote the conservation of Willapa Bay salmon and, in a manner consistent with the provisions of the Pacific Salmon Treaty, pursue the implementation of fishery management actions necessary to achieve agreed conservation objectives.*

Policy Citation – Guiding Principle #6: *Within the Pacific Fishery Management Council (Council) process, support management measures that promote the attainment of Willapa Bay conservation objectives consistent with the Council's Salmon Fishery Management Plan.*

The Pacific Fishery Management Council's (PFMC) utilizes an annual process, that occurs February-April, known as North of Falcon (NOF) for pre-season planning of salmon fisheries in the state of Washington. Willapa Bay fisheries are planned to be prosecuted in a manner to be consistent with PFMC conservation objectives. Willapa Bay coho were added to the Council's Salmon Fishery Management Plan (FMP) beginning in 2011. A stock recruit analysis of Willapa Bay coho was conducted in 2014 to establish biologically based escapement goals and other related fishery metrics to evaluate pre and post season fisheries impacts on the health of this stock. The resulting escapement goal for Willapa Bay coho is 17,200 naturally spawning Willapa Bay coho. The analysis included run reconstructions from brood years prior to the onset of mass marking of hatchery coho produced in Willapa Bay facilities. Thus, the goal consists of both hatchery and natural origin spawning fish. Regional Department staff worked with Council staff to develop an escapement goal based on the previous analysis but would include only natural origin coho. Natural origin coho made up 79% of the total spawning population in the years included in the analysis. This proportion was then applied to the 17,200 naturally spawning escapement

goal to produce an escapement goal of 13,600 natural origin spawners. The natural origin escapement of 13,600 is used internally by WDFW staff to evaluate preseason salmon fishery plans in Willapa Bay, while the 17,200 naturally spawning coho goal is used in the annual PFMC process (Kope, 2014).

Pre-season salmon fishery plans for Willapa Bay fisheries are also planned to be consistent with the provisions and objectives in the Pacific Salmon Treaty. The Pacific Salmon Treaty set limits on catch and interceptions of salmon in international waters from Southeast Alaska to the southern US. As quotas are set for those fisheries each year based on the aggregate total abundance of fish predicted to be available in those international waters, those harvest predictions must be factored in as they affect the numbers of fish returning to Washington. The quotas in the Pacific Salmon Treaty are renegotiated on a ten-year cycle. These negotiations took place in 2018, where abundance-based quotas were set for the harvest of Chinook salmon, coho, and chum in international waters. Reductions in the allowable harvest quotas in fisheries in Southeast Alaska and the West Coast of Vancouver Island should result in additional escapement of Willapa Bay stocks through these fisheries in coming years compared to previous years.

5.0 Fall Chinook Salmon

Chinook salmon have a long history of importance to fisheries and the overall health of the ecosystem of Willapa Bay. Chinook salmon are found in all the major watersheds that drain into Willapa Bay. The most productive of these areas being the Naselle River, Willapa River, and North River watersheds. Returning adults can be encountered in the marine environment from July through November, with peak migration occurring in August. Most of the spawning takes place in the fall, September through November. Like other coastal Chinook salmon populations, Willapa Bay Chinook salmon exhibit an ocean-type life history pattern, where juveniles will emigrate from the freshwater environment as sub-yearlings the following spring and rear in the near shore or estuary environment before migrating to the open ocean.

Historically, Chinook salmon have been the least abundant of the naturally produced Willapa Bay salmonids. Harvest data from commercial fisheries within Willapa Bay estimate Chinook salmon averaged 13% of the total salmon harvest from 1913-1959 and 20% of the salmon harvest in the years 1960-1991 (Suzumoto, 1992). While Chinook salmon have historically been the least prevalent of the three salmon species found within Willapa Bay, they are the most desirable for recreational fishers and their size and relatively good condition make them economically valuable for commercial fishers as well. During policy development much discussion and debate was centered around the allocation of harvestable Chinook salmon.

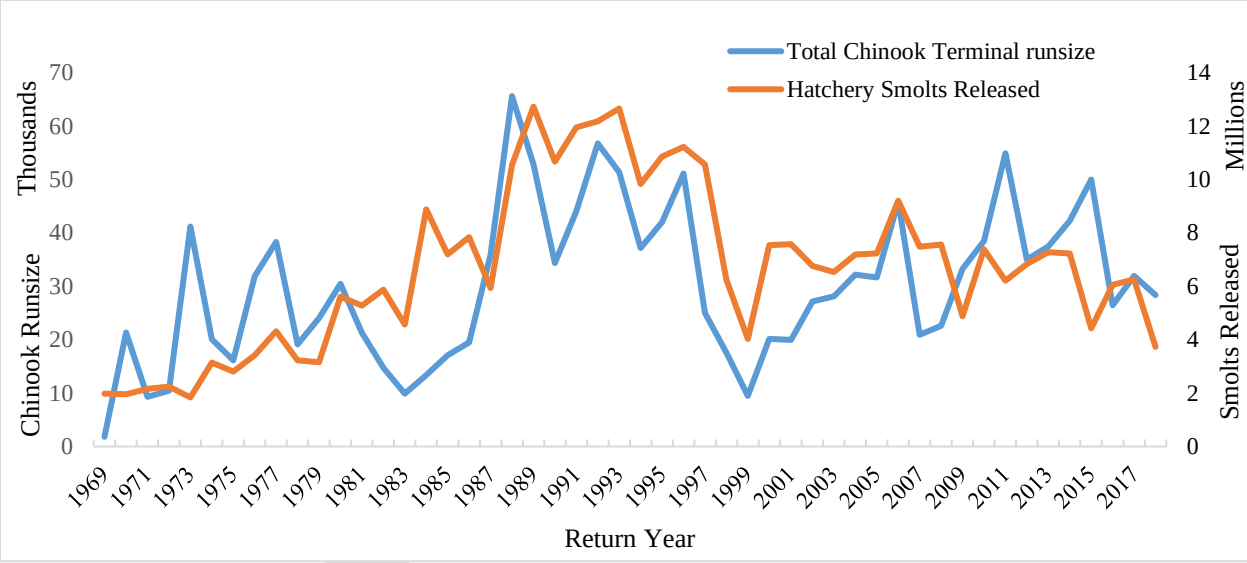


Figure 13. Historical Chinook salmon total run size and hatchery production from 1969 to 2018.

Willapa Bay hatcheries have some of the longest history of fish culture in the entire state hatchery system. The Forks Creek Hatchery was originally constructed in 1899 and the Naselle and Nemah Hatcheries constructed in 1917 and 1953, respectively. As mentioned previously, mass marking of hatchery produced Chinook salmon in Willapa Bay began in the 2010 brood year. The total abundance of Chinook salmon in Willapa Bay has been closely tied to amount of hatchery production for the three hatcheries. Peak production ranged from 10 to 14 million in the 1980's and coincides with the largest total run sizes observed historically (Figure 13).

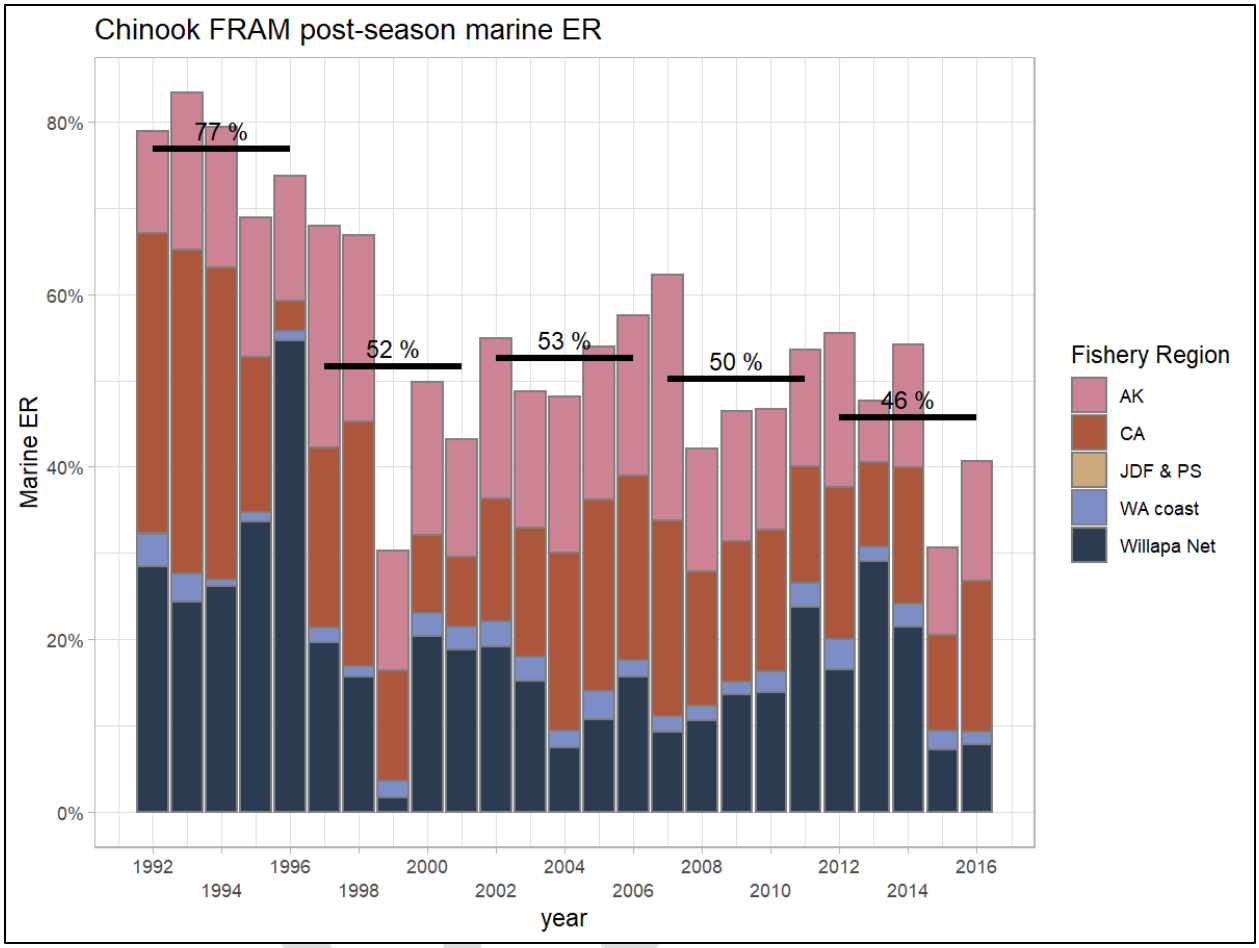


Figure 14. Willapa Bay Chinook salmon historical exploitation rates from all marine area fisheries based on post season FRAM modeling from 1992 to 2016. AK=Alaska, CA= Canada, JDF= Strait of Juan de Fuca, PS= Puget Sound, WA Coast= Marine Areas 1-4, and Willapa Net=Willapa Bay terminal commercial fisheries.

Willapa Bay Chinook salmon have had high rates of exploitation across all fisheries, but these rates have been decreasing in recent years (Figure 14). The Department and PFMC utilize a model called the Fisheries Regulation Assessment Model, or FRAM, to evaluate rates of exploitation on Chinook salmon stocks as a result of fisheries prosecution. The model uses recoveries of CWT's from fisheries throughout the North Pacific including terminal area fisheries. For Willapa Bay Chinook salmon, the only terminal fisheries able to be used in the analysis are commercial fisheries prosecuted in the Willapa Bay estuary as they are the only fisheries that include recovery of CWT's in the fishery monitoring program. Recent reductions in Alaskan and Canadian fisheries as a result of re-negotiation of the Pacific Salmon Treaty will likely contribute to continued decreased exploitation rates of Willapa Bay Chinook salmon moving forward.

5.1 Broodstock Management Objectives

Policy Citation – Broodstock management objectives in Phase One: *Implement hatchery broodstock management actions to promote re-adaptation to the natural environment and enhance productivity of natural-origin Chinook salmon in the North/Smith, Willapa, and Naselle rivers:*

North/Smith – Manage as Wild Salmon Management Zone with no hatchery releases of Chinook salmon.

Willapa – Implement an integrated program with hatchery broodstock management strategies designed to achieve broodstock management standards consistent with a Primary designation in the subsequent cycle.

Naselle – Implement hatchery broodstock strategies designed to achieve broodstock management standards consistent with a Contributing designation in the subsequent cycle.

Along with the use of mark-selective fisheries to remove hatchery fish, implementing broodstock management strategies provided from HSRG recommendations and policy guidance is intended to increase the fitness and viability of salmon populations within the watershed. The Policy called for achievement of these standards for coho and chum populations by 2015 and work towards full implementation for Chinook salmon stocks by 2020. More specifically, Willapa and Naselle river Chinook salmon are managed as integrated programs, with a Primary population designation for Willapa River Chinook salmon and Contributing population designation for Naselle River Chinook salmon. The North River Chinook salmon population was designated as a Wild Salmon Management Zone, which would prohibit the release of hatchery Chinook salmon in this drainage. There have been no hatchery plants of Chinook salmon in this drainage since 1992.

Given the broodstock management strategy of an integrated program as well as a Primary population designation for Willapa River Chinook salmon, HSRG guidelines would be to manage for a PNI of $\geq$ .67 and for a pHOS of $\leq$ 30%. To reach these targets, the agency needed to implement management actions that would increase the number of natural-origin adults utilized as broodstock as well as decrease the proportion of hatchery-origin fish on the spawning grounds. Table 14 shows the estimated HSRG evaluation metrics for hatcheries within the Willapa River and Naselle River basins for the four years prior to policy implementation (e.g. 2011-2014) in comparison to the four years encompassing phase one of the Policy (e.g. 2015-2018). Department staff have increased the number of natural origin fish used in broodstock at Forks Creek Hatchery from an average of 5.4% prior to policy implementation to 58.7% in the years of policy implementation. Correspondingly, the estimated PNI for this program has shown improvement with an average value of 0.43 in the years since policy adoption in comparison to the 0.07 average in the four years prior to policy adoption.

As mentioned above, strategies to reduce pHOS incorporate both the use of selective harvest and removal of excess hatchery fish not necessary for broodstock as those fish recruit to the hatchery. As discussed in section 4.4, mark selective fisheries have been maximized as much as possible for both recreational and commercial fisheries within the management and conservation objectives (i.e. use of harvest rate caps and time, area, and manner restrictions) but have made little positive impact to the estimated pHOS. Conversely, the overall reduction in commercial fishing opportunity as a result of implementation of harvest control rules and time and area restrictions have likely increased pHOS compared to pre-policy levels. Also, the location and current infrastructure of hatchery facilities within Willapa Bay limit the Department's ability to remove hatchery fish prior to reaching the spawning grounds.

During policy development the ALL H Analyzer model was used to estimate hatchery production necessary to meet HSRG guidelines given historic harvest and impact rates in both terminal and pre-terminal fisheries. Modeled results indicated that in order to meet these targets, hatchery production of Chinook salmon in the Forks Creek facility would need to be reduced from their current production goal of 3.3 million smolts pre-policy to 350,000 smolts to bring pHOS levels within acceptable limits. Beginning with the 2015 brood year, Chinook salmon production at Forks Creek Hatchery was reduced to a 350,000 smolt release goal. Results of this program production reduction in relation to pHOS objectives will begin with the 2019 return year as the majority of hatchery produced Chinook salmon in Willapa Bay

return as 4-year old, although full returns won't be represented until 2020. With the reduction of hatchery production and the incorporation of more natural origin Chinook salmon into the broodstock, values for pHOS and PNI should see continued improvement in upcoming years.

Table 14. Estimates of pHOS, pNOB, and PNI for Chinook salmon in the Willapa and Naselle River and pHOS in the North Nemah River from 2011-2018.

Year	Willapa River Forks Creek Hatchery Local Adaptation			Naselle River Naselle Hatchery Local Adaptation			North Nemah River Nemah Hatchery Local Adaptation
	pHOS	pNOB	PNI	pHOS	pNOB	PNI	pHOS
2011	70.30%	6.60%	0.09	86.70%	34.10%	0.28	92.90%
2012	66.10%	6.62%	0.09	91.50%	25.60%	0.22	82.30%
2013	77.10%	6.15%	0.07	81.50%	27.50%	0.25	87.10%
2014	73.70%	2.43%	0.03	81.00%	1.70%	0.02	98.90%
Avg. 11-14	***71.80%***	***5.40%***	***0.07***	***85.20%***	***22.20%***	***0.19***	***90.30%***
2015	69.90%	79.02%	0.53	68.50%	15.40%	0.18	98.10%
2016	80.80%	90.73%	0.53	74.90%	12.10%	0.14	69.00%
2017	75.40%	31.71%	0.3	25.60%	13.90%	0.35	89.50%
2018	53.70%	33.19%	0.38	55.30%	12.30%	0.18	86.30%
Avg. 15-18	***70.00%***	***58.70%***	***0.43***	***56.10%***	***13.40%***	***0.21***	***85.70%***

Naselle River Chinook salmon are managed for a Contributing population designation and the broodstock management strategy is for an integrated program with goals of $\geq$ 0.5 and $\leq$30% for PNI and pHOS, respectively. Table 14 shows a decrease in the amount of pNOB from 22.2% prior to policy to 13.4% after policy adoption. It is important to note that prior to policy adoption Naselle River Chinook salmon were managed as a Primary population. Every effort was made to include natural origin fish into the broodstock using lethal and non-lethal spawning techniques.

The Nemah River Chinook salmon are managed for a Stabilizing population designation, where pHOS goals for the segregated hatchery program are to be no worse than current levels. Given that the pHOS level in the North Nemah River was estimated at 90.3% between 2011-2014 and dropped to 85.7% between 2015-2018, the program is currently meeting this objective.

There is uncertainty as to the effects from the shift in salmon management paradigm resulting from the implementation of the Policy in 2015. These effects will begin to show in 2019 and on. The Policy shifted the primary population for Chinook salmon from the Naselle River stock to the Willapa River stock and Naselle River Chinook salmon were then designated as a contributing stock. This is important because performance metrics associated with hatchery management practices to ensure the recovery then continued overall health of any specific stock are set by the stock's population designation. Given the location of the Forks Creek Hatchery (30 miles upstream) and the lack of infrastructure necessary to prevent hatchery fish from straying to the spawning grounds, the reduction in Chinook salmon production at Forks Creek Hatchery was the only tool the Department has had to be consistent with the watershed's population designation. Due to legislative action occurring after implementation of the Policy (2015),

some of the reduction from Forks Creek Hatchery was shifted to the Naselle Hatchery beginning in brood year 2016. Naselle River Hatchery production of Chinook salmon went from an 800K smolt release goal and increased to 2.5M. It is uncertain how this paradigm shift of moving the majority of the bay wide Chinook salmon production from the north end of the bay (Forks Creek Hatchery) to the south end of the bay (Naselle River Hatchery) will unfold, in relation to Chinook salmon recruitment to the terminal fisheries prosecuted in Willapa Bay. We will begin to see these effects take place in 2019 salmon fisheries. Additionally, Naselle Hatchery Chinook salmon have an average stray rate of 10% to the Willapa River, which was not considered in AHA modeling conducted during policy development. As HSRG considers strays from out of basin locations as being held to the same standards as segregated programs, the Naselle program should not exceed a 5% pHOS to the Willapa River. Limited spawning ground CWT data is available for the Willapa River, but based on data from return year 2015, it is estimated the pHOS from the Naselle to Willapa River was 6.4% based on an average smolt release of approximately 900,000. As such, it is anticipated strays from the increased production at Naselle Hatchery may limit the ability to meet pHOS goals in the Willapa River.

5.1.1 Commissioner's Emphasis Question #13:
What are the specific wild broodstock management standards for chinook salmon that are referred to, and what progress was made over the course of 2015-18 in comparison to a base period prior to Policy adoption?

The specific broodstock management standards for Chinook salmon are described above in section 5.1. While hatchery production programs associated with the Willapa River basin (Forks Creek Hatchery) and the Naselle Hatchery have not reached their specific hatchery reform targets based on the corresponding population designation, improvements were made during policy implementation years in comparison to pre-policy levels. The pHOS in all three river basins was improved from pre-policy levels, most notably in the Naselle River with a reduction of 35%. The Naselle River showed minimal improvements in PNI mostly due to lack of available natural origin broodstock. The Willapa River program showed markedly improved PNI estimates due to increased incorporation of natural origin fish into the broodstock (Table 14). More detailed discussion is included above.

5.1.2 Commissioner's Emphasis Question #18:
What is the working definition of an "integrated program" and a "Primary designation" in this situation and what modifications of the hatchery program were implemented during 2015-18 to achieve the objective of this paragraph?

In this instance, an integrated hatchery program could be simply defined as one that incorporates natural origin fish into the broodstock to promote a genetic profile of hatchery produced fish similar to their natural origin counterparts. The "Primary" designation speaks to the assumed importance of the Willapa River Chinook salmon population to the overall health and recovery of the Chinook salmon population in the aggregate throughout Willapa Bay. To reach the hatchery reform objectives outlined in the Policy, the use of natural origin broodstock was increased and the smolt production goal for this program was reduced from 3.2 million smolts annually to 350,000 smolts. The reduction in smolt production was considered necessary due to the lack of infrastructure necessary to remove excess hatchery origin fish escaping from fisheries.

5.1.3 Commissioner's Emphasis Question #19:
What is the working definition of a "Contributing designation" in this situation and what modifications of the hatchery program were implemented during 2015-18 to achieve the objective of this paragraph?

The "Contributing" designation in this instance refers to the assumed importance of the Naselle River Chinook salmon population to the health and recovery of the Willapa Bay Chinook salmon population in the aggregate but its importance is reduced somewhat from that of the "Primary" populations. In this case, it was assumed the Chinook salmon habitat in the Naselle River watershed was more degraded than that contained in the Willapa River watershed. Improvements to hatchery infrastructure at the Naselle Hatchery weir and attraction channel have provided for increased recruitment of hatchery fish to the facility.

5.2 Fishery Management Objectives

9) Policy Citation – Fishery Management Objectives: *The fishery management objectives for fall Chinook salmon, in priority order, are to:*

d. Achieve spawner goals for the North, Naselle, and Willapa stocks of natural-origin Chinook salmon and hatchery reform broodstock objectives through the two-phase rebuilding program described above.

e. Provide for an enhanced recreational fishing season. The impact rate of the recreational fishery is anticipated to be ~3.2% during the initial years of the policy, but may increase in subsequent years to provide for an enhanced recreational season as described below:

i. Manage Chinook salmon for an enhanced recreational fishing season to increase participation and/or catch including consideration of increased daily limits, earlier openings, multiple rods, and other measures.

ii. Conservation actions, as necessary, shall be shared equally between marine and freshwater fisheries.

f. Provide opportunities for commercial fisheries within the remaining available fishery impacts.

Fishery Management in 2015-2018.

To facilitate a transition to the Willapa River as the primary Chinook salmon population, fisheries during the transition period will be managed with the following goal:

a. The impact rate on Willapa and Naselle river natural origin fall Chinook salmon in Willapa Bay fisheries shall not exceed 20%. Within this impact rate cap, the priority shall be to maintain a full season of recreational fisheries for Chinook salmon in the Willapa Bay Basin.

b. To promote the catch of hatchery-origin Chinook salmon and increase the number of natural-origin spawners, within the 20% impact rate cap the following impact rates (impact rates are included in Table XX) shall be set-aside for mark-selective commercial fishing gear types with an anticipated release mortality rate of less than 35%. The Commission may consider adjustments to the set-asides for 2017 and 2018 based upon the Department's reports to the Commission on commercial mark-selective fishing gear (paragraph 2(b)) or other adaptive management considerations.

c. No commercial Chinook salmon fisheries shall occur in areas 2T and 2U prior to September 16.

d. No commercial Chinook salmon fisheries shall occur in areas 2M, 2N, 2P and 2R until after Labor Day.

Along with the general guidance provided in Policy C-3622, as described in the guiding principles, species specific guidance for Chinook salmon was provided to further refine management objectives. In order to conserve and restore natural origin Chinook salmon within Willapa Bay, the Policy implements a two-phase rebuilding program, which is intended to achieve broodstock management standards by 2020 and the achievement of spawner escapement goals in 16-21 years. Also, across the phases, Chinook salmon are to be managed to provide for a full recreational fishing season with allowances for increased catch and participation in future years. The implementation of phase one in the Policy is defined as years 2015-2018, with phase two beginning in 2019 and beyond.

Specific management objectives for phase one as it relates to Chinook salmon management were to limit the impact rate of fisheries prosecuted within Willapa Bay, both recreational and commercial, to no more than 20% of the natural origin run of Willapa River and Naselle River Chinook salmon stocks. In describing how the allocation of the impacts between the fishing sectors, recreational and commercial, the priority was to provide for a full recreational season directed at Chinook salmon harvest. The Policy also set aside a portion of the 20% impact rate cap on an increasing scale by year for the commercial fishery in an effort to remove hatchery-origin Chinook salmon and increase the number of natural-origin spawners (Table 15). This was to be accomplished using mark-selective fishing gear types that would have a release mortality rate of less than 35%. Lastly, the Policy utilizes time and area closures directed at commercial fisheries to further enhance a recreational priority for Chinook salmon. In the north end of the bay for commercial catch areas 2T and 2U, no commercial fisheries can occur between September 16th and in the south end of the bay for commercial catch areas 2M, 2N, 2P, and 2R, no commercial fisheries can occur until after Labor Day.

Table 15. Commercial fishery mark-selective gear set-aside proportions by fishing year, 2015-2018.

Fishing Year	Mark- Selective Commercial Fishing Gear Set- Aside
2015	1%
2016	2%
2017	6%
2018	6%

Department staff utilize the Willapa Bay TAMM to assess the impact of fisheries prosecution in relation to conservation and management objectives during the pre-season planning process, commonly referred to as North of Falcon (NOF). The model incorporates historic encounters and harvest data generated from post-season run reconstructions to predict estimates of harvest, impacts, and total expected escapement. Post-season estimates of impacts include the effect of in-season management actions described in section 4.6 of this document, while pre-season predictions are based solely on prosecution of the entire fishery package as described pre-season.

Table 16. Evaluation of pre-season prediction and post-season estimate of impact rates on natural-origin Chinook salmon resulting from fisheries prosecution in 2015-2018.

Year	Pre-season Prediction			Post-season Estimate		
	Willapa River	Naselle River	Willapa Bay (aggregate)	Willapa River	Naselle River	Willapa Bay (aggregate)
2015	20.00%	18.80%	19.20%	22.50%	22.20%	22.30%
2016	19.50%	19.40%	20.00%	24.30%	24.60%	21.50%
2017	19.80%	17.90%	19.30%	21.10%	10.90%	14.50%
2018	18.90%	16.80%	17.80%	6.10%	11.20%	8.00%
Average	***19.60%***	***18.20%***	***19.10%***	***18.50%***	***17.20%***	***16.60%***

During the pre-season NOF process, fisheries have been planned to achieve the 20% impact rate cap in all years of policy implementation during phase one, 2015-2018. Post-season estimates of impacts to natural origin Willapa River Chinook salmon have exceeded the management objective in three out of four years (2015-2017). Similarly, post-season estimates have exceeded the management objective two out of four years for the natural origin Chinook salmon in the Naselle River (2015-2016) as well as for the Willapa Bay natural origin stock in the aggregate (Table 16). As noted in section 4.6, post-season estimates of impacts in 2018 were greatly affected by in-season management actions targeted at Chinook salmon. Evaluation of the cause for the post-season estimate over pre-season predicted values would indicate that estimates of impacts attributed to the recreational sector have been severely underestimated. More discussion of management objectives for each fishery sector will follow in the corresponding sections below.

Historically, catches of Chinook salmon within Willapa Bay were dominated by commercial harvest. From 1991 to 2014, 70% of the total landed catch of Chinook salmon was in the commercial sector and ranged from 8% in 1999 to 92% in 1991 (Figure 15). These data resulted in frustration from recreational fishers as to the historical allocation proportions during policy development. In response to the frustration from the public to the past harvest allocation of Chinook salmon, Policy C-3622 took steps to address harvest allocation by prioritizing harvest of Chinook salmon to the recreational fishing sector in describing fishery management objectives specific to Chinook salmon. Specifically, the guidance is to "*provide for an enhanced recreational fishing season*" and to "*increase participation and/or catch including consideration of increased daily limits, earlier openings, multiple rods, and other measures*." Analysis of very limited recreational fishery data during policy development estimated the impact rate to natural origin Chinook salmon in the initial years to be approximately 3.2% and would increase in subsequent years with policy implementation of objectives described above.

Beginning in 2015, the fishery schedules for recreational and commercial fisheries were designed and implemented in a manner such as to meet fishery management objectives described above. By instituting time and space restrictions on the prosecution of commercial fisheries, no commercial fisheries prosecuted until after Labor Day, the marine recreational fishery had unencumbered access to Chinook salmon during peak migration timing. Also, bag limits in marine area recreational fisheries were increased from a historical three fish adult bag to four fish for the 2015 and 2016 fishery year. This four fish bag limit was later reduced to a three fish adult bag as declining terminal run sizes coupled with robust bag limits put attainment of fishery management and broodstock collection objectives at risk. For freshwater recreational fisheries, sections of the Willapa River, Naselle River, and North Nemah River that had historically been closed for directed Chinook salmon harvest were opened beginning August 1 as opposed

to the historical October 1 opening date. Freshwater bag limits were also increased similar to the marine area bag limits and the use of the two-pole endorsement was expanded into tidally influenced freshwater sections of the Willapa and Naselle Rivers. The fishery management actions described above resulted in much of the allocation of Chinook salmon harvest from the commercial sector to the recreational fishery sector (Figure 15).

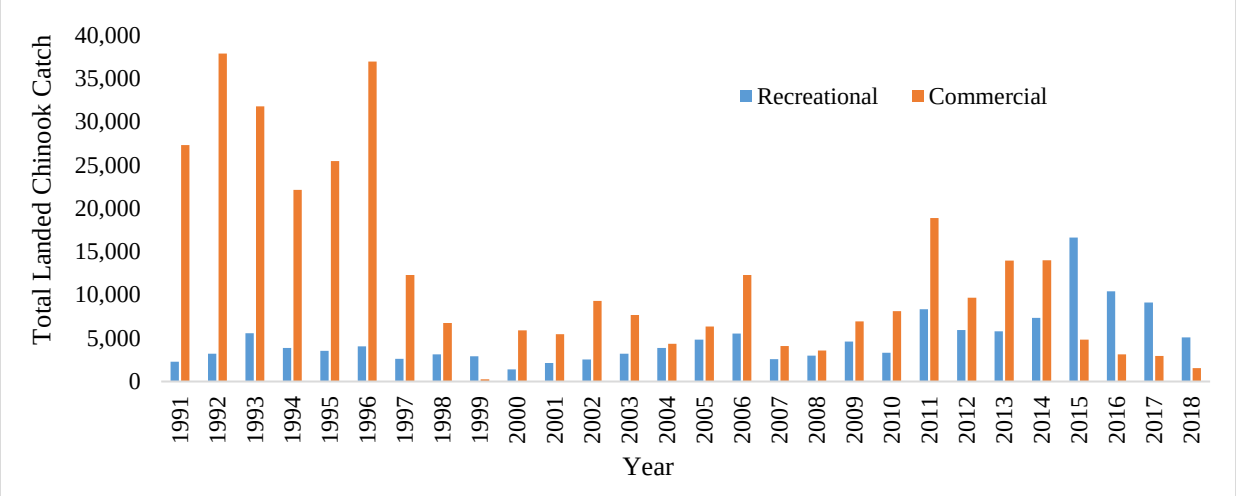


Figure 15. The total landed catch of Chinook salmon in Willapa Bay fisheries by recreational sector (blue lines) and commercial sector (orange lines) from 1991-2018.

5.2.1 Commissioner's Emphasis Question #7:
What has been the change in the distribution of fishing effort throughout the Willapa Bay Basin during 2015-18 in comparison to the four-year period prior to Policy adoption?

There is no information on the changes to the distribution of fishing effort available.

5.2.2 Commissioner's Emphasis Question #22:
What changes in these recreational fishery management measures occurred during 2015-18, from the four-year period prior to Policy adoption?

Some of the changes that have occurred to recreational fisheries management include:

- increased bag limits from two fish adult bag to four fish adult bag limits;
- increased allowance of the two-pole endorsement (marine and some freshwater tributaries);
- opening of sections in the Nemah and Naselle rivers that were previously closed to salmon fishing; and
- opening sections of rivers below hatcheries in the Willapa, Nemah, and Naselle rivers as early as August 1 to provide Chinook salmon directed opportunity for recreational anglers.

More detailed discussion of management changes for recreational fisheries is included above.

5.2.3 Commissioner's Emphasis Question #23:
What are the actual aggregate Willapa Bay Chinook salmon impact rates that occurred 2015-18, in comparison to the four years prior to Policy implementation?

The estimated impact rates to the aggregate Willapa Bay natural origin Chinook salmon population have decreased from the estimated rates prior to policy adoption. On average, the natural origin impact rate has decreased by 57% with an average of 16.6% impact during the Policy implementation years in

comparison to 38.0% in the four years prior to policy adoption (Table 17). The increase of active monitoring programs in both the recreational and commercial fisheries has increased the rigor of estimates during policy implementation. Estimates may not be applicable to direct comparison to estimates derived prior to enhancements made to the monitoring programs.

Table 17. Estimates of the aggregate natural origin impact rates on Willapa Bay Chinook salmon from 2011-2018.

Year	Chinook Impact Rate
2011	24.6%
2012	42.2%
2013	28.1%
2014	57.2%
Avg. 11-14	***38.0%***
2015	22.2%
2016	21.5%
2017	14.5%
2018	8.1%
Avg. 15-18	***16.6%***

5.3 Recreational Fisheries

The implementation of fishery management objectives outlined in Policy C-3622 has led to an increased harvest allocation of Chinook salmon to the recreational sector. The total recreational harvest of Chinook salmon in the four years (e.g. 2011-2014) proceeding policy implementation averaged 6,866 fish, 33% of the total harvest allocation, as opposed to an average of 10,327 fish, 77% of the total harvest allocation, in the four years of policy implementation (e.g. 2015-2018) (Figure 15). Much of the increased Chinook salmon harvest observed during policy implementation was to the marine fishery. The average landed catch of Chinook salmon in the marine area in the four years prior to policy implementation was 2,751 fish as opposed to an average of 5,459 fish in the years the policy was in effect. Conversely, freshwater fisheries had a marginal increase in landed catch from the four years prior to policy implementation, with an average of 4,115 fish pre-policy to 4,869 fish since policy implementation (Figure 16).

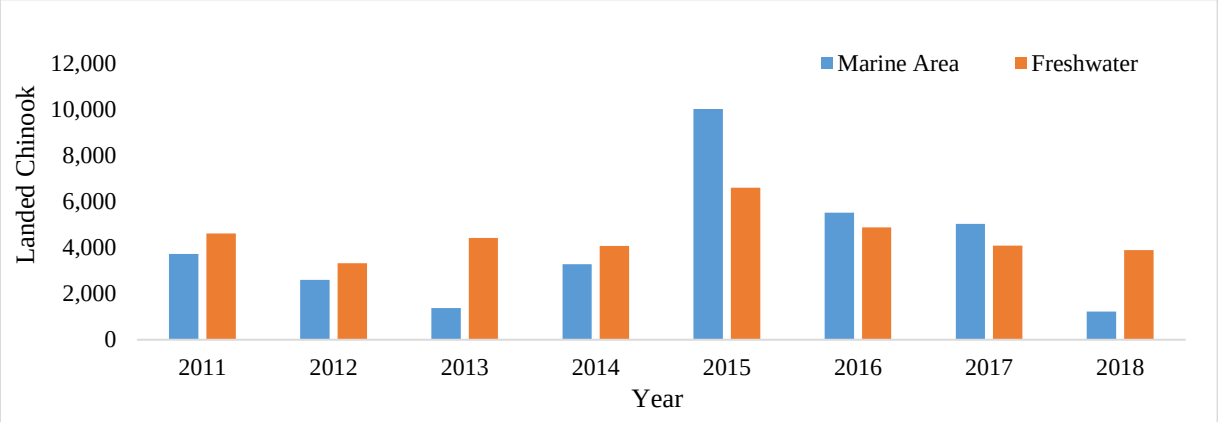


Figure 16. The landed catch of Chinook salmon by recreational fishing area from 2011-2018. Marine area (blue lines) and freshwater (orange lines).

Fishery management actions focused on providing a full and enhanced recreational fishery in Willapa Bay have led to an increase to the recreational impact rate on natural origin Chinook salmon. During policy development, the impact rate on natural origin Chinook salmon resulting from prosecution of recreational fisheries was assumed to be approximately 3.2%. In all years of policy implementation, except for 2018, the natural origin impact of recreational fisheries exceeded the assumed rate. During 2018, recreational and commercial fisheries were closed via emergency regulation as a conservation measure as in-season data showed the abundance of Chinook salmon was less than predicted preseason. During the years of policy implementation, marine and freshwater recreational fisheries combined for an average impact rate of 11.4% and 5.0% on Willapa River and Naselle River natural origin Chinook salmon, respectively. Overall, the combined impact rate of marine and freshwater fisheries averaged 7.2% on natural origin Willapa Bay Chinook salmon stocks in the aggregate (Table 19). These impact rates were also above the preseason predicted rates developed during the annual preseason salmon fishery planning process (Table 18).

Table 18. The preseason predicted estimates of impact rates to natural origin Chinook salmon from marine area 2.1 (MA 2.1) and freshwater (FW) fisheries from 2015 to 2018.

Year	Pre-Season Prediction								
	Willapa River			Naselle River			Willapa Bay		
	MA 2-1	FW	Total	MA 2-1	FW	Total	MA 2-1	FW	Total
2015	4.00%	1.50%	5.50%	1.10%	1.20%	2.30%	2.10%	1.90%	4.00%
2016	5.60%	2.10%	7.70%	0.70%	1.30%	2.00%	2.80%	2.00%	4.80%
2017	7.60%	4.50%	12.10%	1.10%	2.30%	3.40%	4.10%	3.80%	7.90%
2018	11.60%	0.90%	12.50%	2.50%	1.20%	3.70%	7.40%	1.40%	8.80%
Average	**7.20%**	**2.30%**	**9.50%**	**1.40%**	**1.50%**	**2.90%**	**4.10%**	**2.30%**	**6.40%**

Table 19. The postseason estimates of impact rates to natural origin Chinook salmon from marine area 2.1 (MA 2.1) and freshwater (FW) fisheries from 2015 to 2018.

Year	Post-Season Estimate								
	Willapa River			Naselle River			Willapa Bay		
	MA 2-1	FW	Total	MA 2-1	FW	Total	MA 2-1	FW	Total
2015	10.00%	5.00%	15.00%	4.40%	2.30%	6.70%	5.90%	4.50%	10.40%
2016	14.00%	1.10%	15.10%	3.60%	2.20%	5.80%	7.50%	1.70%	9.20%
2017	9.50%	3.10%	12.60%	2.00%	2.80%	4.80%	3.30%	3.00%	6.30%
2018	2.00%	0.80%	2.80%	0.70%	1.90%	2.60%	1.20%	1.70%	2.90%
Average	**8.90%**	**2.50%**	**11.40%**	**2.70%**	**2.30%**	**5.00%**	**4.50%**	**2.70%**	**7.20%**

The total landed harvest of Chinook salmon in recreational fisheries has also exceeded preseason predictions in most years. Most of that increase has been in marine area 2.1 recreational fisheries. With the one exception of the 2018 fishery year in which in-season action was taken to ensure attainment of conservation objectives for Chinook salmon as described in section 4.6 of this document. The marine area fishery on average exceeded preseason predictions of harvest by 170%, however, the freshwater fisheries utilized 85% of the preseason harvest estimate (Table 20).

Table 20. The preseason predicted and postseason estimates of landed harvest of Chinook salmon from marine area 2.1 and freshwater fisheries from 2015 to 2018.

Year	Pre-Season Prediction		Post-Season Estimate	
	MA 2-1	FW	MA 2-1	FW
2015	2,756	4,694	10,040	6,607
2016	3,765	5,424	5,527	4,887
2017	2,431	4,810	5,044	4,089
2018	3,942	8,033	1,224	3,891
Average	***3,224***	***5,740***	***5,459***	***4,869***

5.3.1 Commissioner's Emphasis Question #6:
Is there a discernable measurement to show if there has been any change in non-fishing related outdoor recreational experiences available to the public? If so, does it show that this policy intent was achieved, or that there has been a change in such recreational opportunity since the Policy was adopted?

No discernable measurements of non-fishing related outdoor recreational experiences are available.

5.3.2 Commissioner's Emphasis Question #16:
Has there been any recreational fishing closures from normally open seasons for chinook salmon over the course of 2015-18, what are the angler trip and catch estimates for the recreational fishery for chinook salmon 2015-18, and how do they compare with the four years prior to adoption of this Policy?

As described in section 4.6 of this document, recreational fisheries were closed by emergency regulation in 2018, specifically, for Chinook salmon. Estimates of the number of angler trips increased by 188% during the initial years of policy implementation (2015-2018), compared to the four years previous (2011-2014). Angler trip estimates apply to only marine area fisheries as CPUE data necessary to generate similar estimates for freshwater fisheries are unavailable. Similarly, the landed catch of Chinook salmon in recreational fisheries, in both marine and freshwater environments, increased by 151% during the same time frame (Table 21).

Table 21. Estimates of angler trips and landed catch of Chinook salmon in Willapa Bay recreational fisheries from 2011 to 2018.

Year	Angler trips (Marine Area only)	Landed Catch (Marine Area and freshwater)
2011	14,388	8,348
2012	10,043	5,933
2013	5,328	5,815
2014	12,668	7,368
Average	***10,607***	***6,866***
2015	21,453	16,647
2016	27,961	10,414
2017	21,500	9,133
2018	9,254	5,115
Average	***20,042***	***10,327***

5.3.3 Commissioner's Emphasis Question #21:

What has been the Chinook salmon recreational fishery impact rate 2015-18 and the four years prior to Policy adoption?

The post season estimate of the recreational impact rate on natural origin Willapa Bay Chinook salmon resulting from mark selective marine and freshwater fisheries increased during policy implementation compared to pre-policy levels. The average recreational impact rate is 7.2%, which is an 128.6% increase of the pre-policy average estimate of 5.6%. It is important to note that more robust active monitoring of marine area recreational fisheries provided for more thorough accounting of impacts occurring in the marine environment. These enhancements occurred incrementally during the policy implementation years. Therefore, direct comparisons of estimated impacts pre and post policy implementation may not be relevant.

Table 22. Post-season estimated impact rates on natural origin Chinook salmon during recreational fisheries from 2011 to 2018.

Year	Chinook Impact Rate
2011	3.33%
2012	4.45%
2013	8.58%
2014	6.04%
Average 11-14	***5.60%***
2015	10.32%
2016	9.25%
2017	6.31%
2018	2.95%
Average 15-18	***7.21%***

5.4 Commercial Fisheries

The implementation of fishery management objectives outlined in Policy C-3622 has led to a decreased harvest allocation of Chinook salmon to the commercial fishery sector. The total commercial harvest of Chinook salmon in the four years (e.g. 2011-2014) proceeding policy implementation averaged 14,146 fish, 67% of the total harvest allocation, as opposed to an average of 3,115 fish, 23% of the total harvest allocation, in the four years of policy implementation (e.g. 2015-2018; Figures 15 and 17).

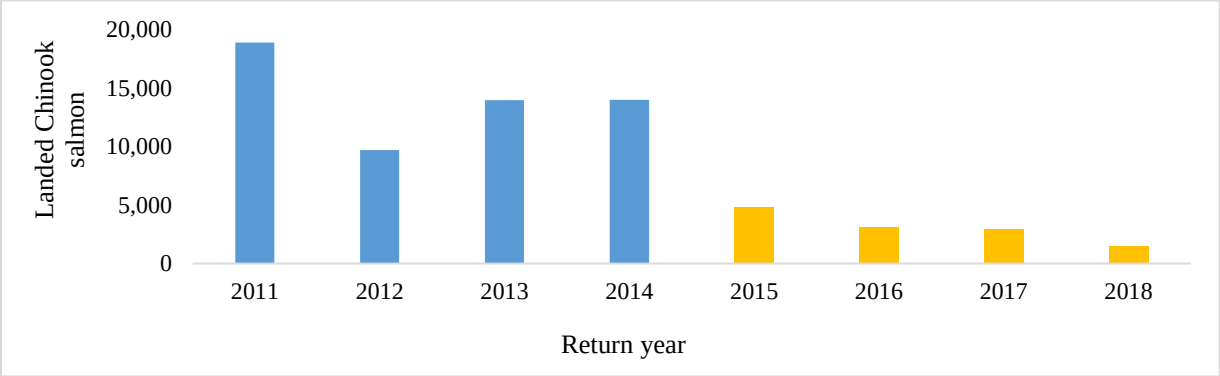


Figure 17. The total landed catch of Chinook salmon from commercial fisheries in Willapa Bay pre-policy (blue lines) and during policy (orange lines).

During the four years of policy implementation, commercial fisheries in Willapa Bay were scheduled as mark selective fisheries, which require the release of unmarked Chinook salmon, and to conform to time and area restrictions outlined in the fishery management objectives for Chinook salmon. Specifically, commercial fisheries in the northern portion of the bay in commercial catch areas 2T and 2U, did not occur prior to September 16. Commercial fisheries in the southern areas of the bay in commercial catch areas 2N, 2R, and 2M, did not open prior to the Labor Day holiday. Beginning with the 2015 fishery, the use of alternative gear, in the form of tangle nets, were phased in so as to limit the number of mortalities to unmarked Chinook salmon and to maximize harvest of hatchery fish. With the removal of commercial fishing opportunity in August, the majority of the total Chinook salmon encountered in commercial fisheries occur in September, and as such the use of tangle nets was typically scheduled for use during the first two to three weeks of the month. As noted in the Policies' fishery management objectives outlined in the coho species specific guidance, the coho management period begins September 16. In the 2015 fishery season, tangle net fisheries were scheduled first for use on a limited number of opening days and only in one commercial catch area, 2U, to test their ability to catch fish in Willapa Bay. Following their initial trial, the use of this gear type was expanded, and commercial fisheries scheduled prior to September 16 exclusively used tangle net in the three remaining years of policy implementation and in some cases even into the coho management period.

Table 23. The preseason predicted and postseason estimates of natural origin Chinook salmon impact rates from commercial fisheries in Willapa Bay from 2015 to 2018.

Year	Pre-Season Prediction			Post-Season Estimate		
	Willapa River	Naselle River	Willapa Bay (aggregate)	Willapa River	Naselle River	Willapa Bay (aggregate)
2015	14.50%	16.50%	15.20%	7.50%	15.50%	11.90%
2016	11.80%	17.30%	15.10%	9.20%	18.80%	12.30%
2017	7.80%	14.40%	11.30%	11.00%	6.70%	8.20%
2018	6.40%	13.00%	9.00%	3.50%	9.10%	5.10%
Average	***10.10%***	***15.30%***	***12.70%***	***7.80%***	***12.50%***	***9.40%***

On average for the four years of policy implementation, commercial fisheries prosecuted in Willapa Bay resulted in a lower rate of unmarked Chinook salmon mortalities and harvest of hatchery fish than was predicted preseason. As discussed in section 4.6 of this document, in-season management actions were taken in 2015 and 2018 directly as a result of in-season monitoring data estimating a higher rate of unmarked mortalities occurring than was predicted preseason. As shown in Table 23, those in-season management actions were effective in limiting the commercial fisheries impact to unmarked Chinook salmon below preseason predicted values. Across the four years of policy implementation, post season estimates of the impact rate resulting from commercial fisheries to unmarked Chinook salmon was below the preseason prediction. For Willapa River and Naselle River Chinook salmon, the post season rate only achieved 77% and 82% of the preseason predicted value, respectively. Overall, the post season impact to Willapa Bay Chinook salmon in the aggregate was 9.4% compared to the average impact rate of 12.7% predicted preseason. Similarly, the harvest of marked Chinook salmon dropped below preseason expectations as well. Across all years of policy implementation, the average harvest of marked Chinook salmon in commercial fisheries was 3,115 fish or 50% of the average preseason predicted value of 6,169 fish (Table 24).

Table 24. The preseason predicted and postseason landed catch of Chinook salmon in Willapa Bay commercial fisheries from 2015 to 2018.

Year	Pre-Season Prediction	Post-Season Estimate
2015	5,139	4,840
2016	7,019	3,142
2017	6,217	2,942
2018	6,299	1,534
Average	***6,169***	***3,115***

5.5 Hatchery Production

As noted above, hatchery facilities in Willapa Bay are some of the oldest in the state. During the early 1900's, Forks Creek and Naselle River Hatcheries primarily produced Chinook salmon and coho to supplement harvest in commercial fisheries. Historic releases of Chinook salmon smolts from the Forks Creek Hatchery was consistent at two million in the later part of the 20th century up until 2010 with the implementation of the 2010 draft salmon management policy. Beginning with the 2010 brood, the production at this facility was increased to 3.3 million smolts annually. Conversely, the Naselle River Hatchery has experienced a wide range of Chinook salmon production, with peak production occurring in the late 1980's and 1990's. The smolt releases from the Naselle River Hatchery has varied from around one million smolts as called for in the draft 2010 salmon management policy to a high close to eight million during the peak production. Nemah Hatchery, historically, has produced between one and two million smolts annually. Chinook salmon production at this facility is limited by available broodstock (Figure 18).

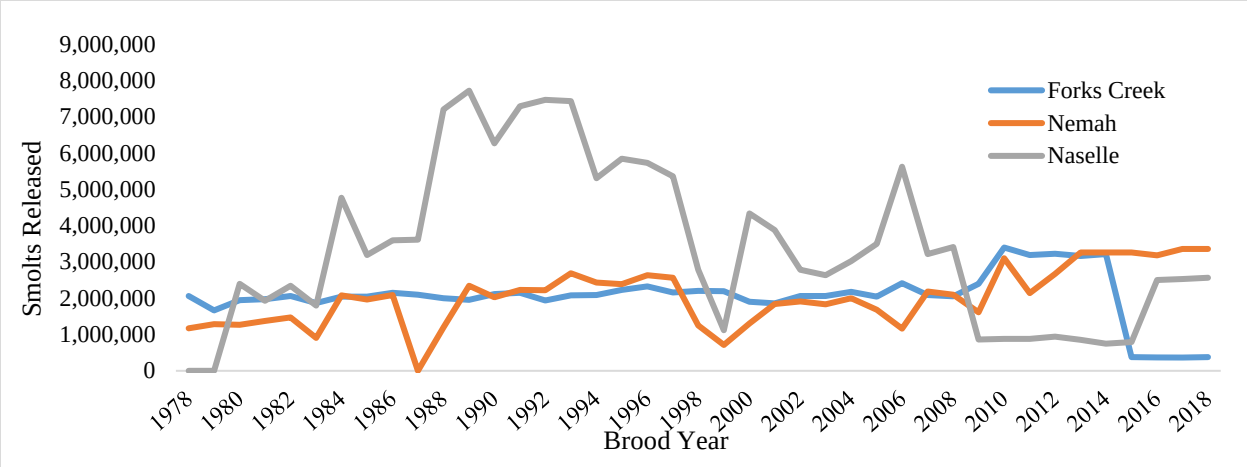


Figure 18. Historic hatchery production of fall Chinook salmon from Willapa Bay Facilities from brood year 1978 to 2018.

In the species-specific guidance section on Chinook salmon in the Willapa Bay Salmon Management Policy C-3622 hatchery production goals for Willapa Bay facilities are described as follows:

- Naselle Hatchery – 0.8 million
- Nemah Hatchery – 3.3 million
- Forks Creek Hatchery – 0.35 million

As shown in Figure 18, beginning with the 2015 brood year, smolt releases conformed to policy guidance for the Forks Creek and Nemah hatcheries. Due to legislative action, the smolt release for Chinook salmon at the Naselle Hatchery was increased from the 0.8 million to 2.5 million beginning in the 2016 brood year. Moving forward, in an effort to increase the prey availability for Southern Resident Killer Whales (SRKW) along with funding provided by the legislature to enhance fisheries, fall Chinook salmon production goals will be 0.4 million at Forks Creek, 3.3 million at Nemah Hatchery, and 5 million at the Naselle Hatchery (Table 25). These changes to hatchery production for fall Chinook salmon are proposed for the 2020 brood year.

Table 25. Fall Chinook salmon hatchery production goals beginning with the 2020 brood year.

Facility	Forks Creek	Nemah	Naselle	Total
Production Goal	0.4 million	3.3 million	5 million	**8.7 million**

5.5.1 Commissioner's Emphasis Question #27:
What are the actual fall Chinook salmon production and release location specifics for the hatcheries listed and how does this compare to the four years prior to Policy adoption?

The actual fall Chinook salmon smolt releases for all three Willapa Bay hatcheries by brood year are listed in Table 26. All Chinook salmon smolt releases from these facilities occur on-station. With policy implementation, Chinook salmon production in the Willapa River drainage occurring at Forks Creek has been reduced to an average of 372,023 smolts released as opposed to approximately 3.2 million smolts in the four years prior. Nemah Hatchery released an average of 2.8 million smolts prior to policy implementation to 3.3 after policy adoption. Naselle River Hatchery production was to remain constant to

previous years release targets with policy adoption in 2015, but as noted above production was increased for the 2016 brood by legislative action.

Table 26. Fall Chinook salmon smolt releases by brood year from Willapa Bay Hatchery facilities 2011-2018.

Brood Year	Facility		
	Forks Creek Hatchery	Nemah Hatchery	Naselle Hatchery
2011	3,189,750	2,143,965	878,100
2012	3,227,824	2,670,865	940,800
2013	3,166,719	3,260,505	850,000
2014	3,221,073	3,264,062	749,265
Average	***3,201,342***	***2,834,849***	***854,541***
263%2015	379,192	3,259,623	788,229
2016	368,537	3,185,438	2,499,279
2017	365,864	3,358,383	2,531,859
2018	374,500	3,359,009	2,567,614
Average	***372,023***	***3,290,613***	***2,096,745***

5.6 Stock Assessment

Consistent with other areas, the Willapa Bay basin is surveyed using float and foot surveys across index and supplemental reaches. When environmental conditions allow, sections of streams are surveyed weekly (indexes) to provide information on spawn timing and spawner abundance relative to past years. Index surveys are complimented with supplemental surveys, which are generally conducted once annually during the peak of spawning. Supplemental surveys provide information on spawning distribution in the watershed and additional information on current abundance compared to previous years data in these reaches.

Table 27. Actual Chinook salmon spawning ground survey mileage pre policy (2011-2014) and during policy (2015-2018).

Chinook		Indexes				Supplemental			
Basin	Miles of spawning habitat (averaged)	2011-2014 (averaged)		2015-2018 (averaged)		2011-2014 (averaged)		2015-2018 (averaged)	
		Miles surveyed	%	Miles surveyed	%	Miles surveyed	%	Miles surveyed	%
North	38.6	1.5	4%	1.65	4%	7.8	20%	7	18%
Willapa	70	5.1	7%	5.5	8%	8.3	12%	14.8	21%
Palix	3.3	1.6	49%	1.6	49%	0	0%	0	0%
Nemah	18.3	0.3	2%	3.025	17%	5.9	32%	6.7	37%
Naselle	49.3	2	4%	2.6	5%	18.6	38%	10.2	21%
Bear	8.5	0	0%	0.2	2%	1.1	13%	1.4	16%
Total	**187.9**	**10.5**	**6%**	**14.6**	**8%**	**41.7**	**22%**	**40**	**21%**

Department staff surveyed an average of 10.5 index miles pre policy (2011-2014), whereas an average of 14.6 miles were surveyed during policy implementation (2015-2018). When combined, Department staff surveyed a total of 52.2 miles of index and supplemental surveys pre-policy (2011-2014) and 54.6 miles during policy years (2015-2018). In total, 28% of the available spawning habitat was surveyed pre policy (2011-2014) and 29% surveyed during policy years (2015-2018; Table 27). During policy implementation, to increase overall spawning ground survey coverage, some supplemental survey reaches were converted to index surveys, which are conducted weekly.

Carcasses are used to identify origin composition and to help the stock assessment biologist breakout hatchery origin spawners (HOS) and/or natural origin spawners (NOS) from the Willapa Bay total overall basin escapement. This process has changed with the implementation of Policy C-3622 to provide more resolution to the NOS/HOS breakouts. Initially, carcasses were compiled as a bay-wide aggregate, proportioned by mark status. Those proportions were then applied to systems with hatchery production. Whereas, river systems without hatchery production were assumed to be all NOS and any hatchery carcasses found would be considered a stray (e.g. North River). Currently, Department staff proportion the carcasses by mark status for each basin (and sub-basin, when applicable), and whether the fish is observed above or below a weir. Once the carcasses are proportioned by mark status, the proportions of each are applied to the total basin escapement.

Table 28. Chinook salmon spawning escapements from the Primary and Contributing stock populations from 2011-2018.

Year	Willapa Bay NOS goal: 4,353		North/Smith Primary NOS goal: 991		Willapa River Primary NOS goal: 1,181		Naselle River Contributing NOS goal: 1,546	
	NOS	HOS	NOS	HOS	NOS	HOS	NOS	HOS
2011	3,331	13,998	298	0	1,473	3,494	1,415	9,240
2012	2,057	9,035	168	0	1,191	2,319	581	6,294
2013	1,669	6,530	113	0	481	1,621	767	3,390
2014	1,936	8,107	99	89	784	2,196	975	4,150
2015	2,043	5,488	173	0	1,064	2,476	483	1,048
2016	1,580	4,592	194	0	575	2,420	597	1,786
2017	3,008	6,276	206	0	1,219	3,746	1,172	403
2018	2,821	3,371	366	0	1,623	1,923	679	814
Avg. 11-14	**2,248**	**9,418**	**170**	**22**	**982**	**2,408**	**935**	**5,769**
Avg. 15-18	**2,363**	**4,932**	**235**	**0**	**1,120**	**2,641**	**733**	**1,013**

The North River basin Chinook salmon stock, encompassing Smith Creek, is designated as "Wild Salmon Management Zone" in Policy C-3622 and consequently has a "Primary" population designation. It was chosen based on the absence of hatchery Chinook salmon supplementation as well as some evidence of a unique genetic makeup compared to the rest of Willapa Bay Chinook salmon stocks. The majority of known Chinook salmon spawning occurs in Fall River and the headwaters of the North River. Due to habitat degradation, there is very little spawning habitat remaining in this basin and could be a contributing factor for the decreased Chinook salmon production. Natural origin Chinook salmon spawners have increased from an average of 170 fish in pre-policy (2011-2014) to an average of 235 fish post- policy implementation (2015-2018; Table 28). While average escapement estimates from both time

periods fail to reach the 991 NOS escapement goal, this is a 38% increase. Due to the lack of hatchery supplementation, the North River basin sees little to no production of HOS. The only year reported to have hatchery origin spawners was 2014 and is likely due to a stray hatchery carcass found on the spawning grounds. Due to challenges associated with carcass recoveries in the North River basin for Chinook salmon, this number may have been higher if a larger sample size of carcasses had been recovered.

Willapa River, a "Primary" population designation, continually produces the largest Chinook salmon spawning population of the six major basins in Willapa Bay. The mainstem habitat is predominantly agriculture with low gradient streams. Willapa River has the second highest NOS escapement goal of 1,181 Chinook salmon. Willapa River has the highest NOS average at 1,051 Chinook salmon and second highest HOS with 2,524 Chinook salmon within the Willapa Bay basin. The Chinook salmon NOS in Willapa River has increased from an average of 982 Chinook salmon pre-policy (2011-2014) to 1,120 Chinook salmon post policy (2015-2018). The HOS has increased from 2,408 Chinook salmon pre-policy to 2,641 fish post-policy (Table 28). The pHOS has remained consistent at 71% pre-policy and 70% post-policy implementation (Table 14). Based on the "Primary" population designation for Willapa River Chinook salmon, the pHOS levels are more than double the 30% recommended pHOS for this system. The pHOS and HOS will be important metrics to follow in the next policy review as the effects of the decreased hatchery production should be brought to light.

The Naselle River has the highest Chinook salmon NOS escapement goal of 1,547 fish (Table 28). Naselle River has failed to meet the NOS escapement goal in 18 of the last 19 years and all eight years (2010 – 2018) being examined for pre and post-policy implementation. The Naselle River Chinook salmon NOS have decreased from an average of 935 fish in the four years of pre-policy (2011-2014) to an average of 733 fish in the four years post-policy implementation (2015-2018). The HOS have also decreased from an average of 5,769 fish pre-policy to an average 1,013 fish post-policy implementation. The Naselle River basin has seen the biggest reduction in the total Chinook salmon spawning escapement from an average 6,703 Chinook salmon in the years leading up to the policy to an average of 1,746 Chinook salmon in the four years after the policy was implemented (Table 28). This is a 74% reduction in escapement and accounts for 113% of the total escapement reductions bay wide from pre and post-policy averages. This is a result of an increase in removing hatchery fish that recruit to the Naselle River Hatchery and not allowing these fish to be passed upstream to spawn naturally as was the practice prior to policy implementation.

Table 29. Chinook salmon spawning escapements from Bear, Palix, and Nemah River basins from 2011-2018.

Year	Bear River			Palix River			Nemah River		
	Stabilizing NOS goal: 306			Stabilizing NOS goal: 104			Stabilizing NOS goal: 204		
	NOS	HOS	Total	NOS	HOS	Total	NOS	HOS	Total
2011	25	0	25	23	0	23	97	1264	1361
2012	15	0	15	11	0	11	91	422	513
2013	60	0	60	23	0	23	225	1519	1744
2014	30	0	30	29	0	29	19	1672	1691
2015	211	0	211	77	144	221	35	1820	1855
2016	31	0	31	17	16	33	166	370	536
2017	120	0	120	42	0	42	249	2127	2376
2018	0	0	0	52	0	52	101	634	735
Average 11-14	**33**	**0**	**33**	**22**	**0**	**22**	**108**	**1,219**	**1,327**
Average 15-18	**91**	**0**	**91**	**47**	**40**	**87**	**138**	**1,238**	**1,376**

The remaining three basins in Willapa Bay; Palix, Nemah, and Bear Rivers, comprise 9.5% of the NOS Chinook salmon within Willapa Bay. All three of these basins have seen an increase of natural origin spawners from pre-policy (2011-2014) to post-policy implementation (2015-2018; Table 29). Bear River increased from an average of 33 NOS pre-policy to an average of 91 NOS post-policy implementation. Palix River increased from an average of 22 NOS pre-policy to an average of 47 NOS post-policy implementation. Nemah River has seen a slight increase from an average of 108 NOS pre-policy to an average of 138 NOS post-policy implementation. Bear and Palix rivers have no hatchery supplementation. The few HOS displayed in Table 29 are carcasses sampled from spawning ground surveys from hatchery fish that have strayed from their natal streams. Similar to Fall River previously mentioned, carcasses are difficult to find and sample in these river systems due to their low escapements. A small sample size can have a disproportionate weight over the NOS and HOS breakouts. Unlike the Bear and Palix rivers, the Nemah River basin is heavily supplemented with hatchery Chinook salmon. The HOS in the Nemah River has remained stable with an average of 1,219 HOS pre-policy and 1,238 post-policy implementation. Overall, Willapa Bay total NOS Chinook salmon have remained relatively steady, only slightly increasing from 2,248 fish on average to 2,363 fish, which results in a 5% increase between pre and post-policy implementation. Willapa Bay total HOS Chinook salmon decreased from an average of 9,418 fish pre-policy to an average of 4,932 HOS Chinook salmon post-policy, a reduction of 47.6% (Table 29).

5.6.1 Commissioner's Emphasis Question #17:

Has there been an increase in the overall number of natural-origin Chinook salmon spawners in the Willapa basin, or an increase in specific river systems?

As reported above, the number of Willapa Bay natural origin Chinook salmon spawners has increased by 5% in the years of policy implementation compared pre policy levels. Increases in natural origin Chinook salmon spawners have been documented in five out of the six tributary systems of the Willapa Bay watershed with the lone exception being the Naselle River population (Table 28 and Table 29).

6.0 Coho Management

Historically, coho run sizes in Willapa Bay have been consistently abundant with year-to-year variation (Figure 19). Coho are the most widespread of salmonid species within Willapa Bay and can be found utilizing many river systems throughout the basin. However, coho run size data from 1990 to 2018 has shown a gradual decline, especially in more recent years (Figure 19). This is not a concern specific to Willapa Bay, as the entire North Pacific has experienced significant decreases in coho returns over that same timeframe. Coho migration through the marine area of Willapa Bay typically occurs from September through January, with peak migration timing occurring in mid-December and January. However, Willapa Bay has both normal and late timed hatchery programs. The normal timed coho run timing typically occurs from September through October and the late timed coho run timing is usually from November through January/February. Coho can be found in all major tributary river systems in Willapa Bay and typically can be found spawning from November through February in the headwaters and smaller tributary reaches of these systems (Suzumoto, 1992). Juveniles will start to migrate to the sea as yearlings in the spring of their second year. They then spend 16-20 months rearing in the ocean before returning to freshwater as three-year-old adults to spawn.

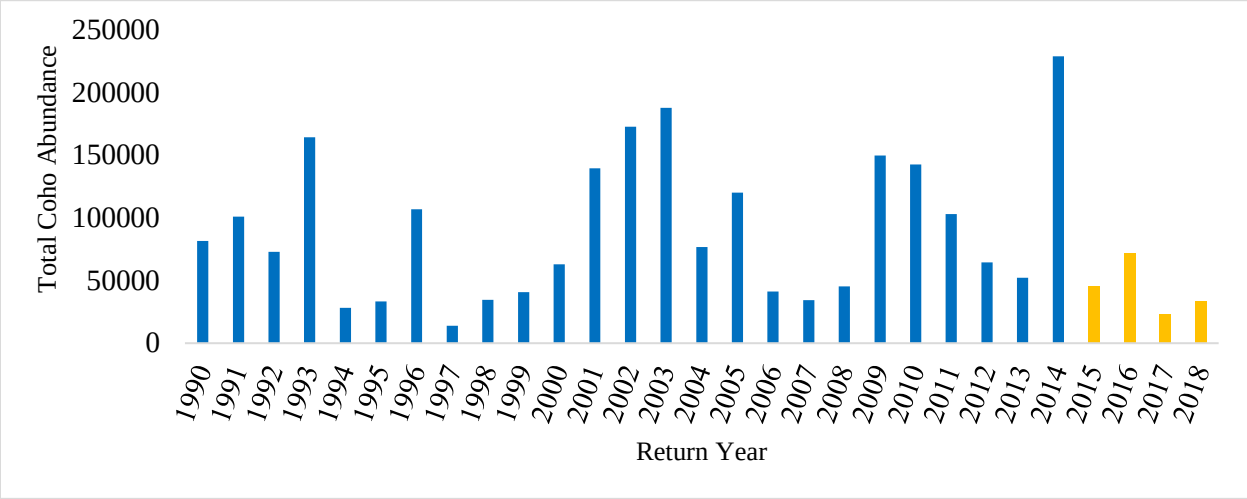


Figure 19. Historic Willapa Bay coho total terminal abundances pre policy (blue lines) and during policy (orange lines).

The total terminal abundance of adult coho salmon returning to Willapa Bay over the last three decades have been variable but abundant. The average adult abundance of coho from 1990-2018 is 85,238 fish (Figure 19). The escapement objective is currently 13,600 fish and a harvestable surplus of coho for commercial and recreational fishers has been available 93% of the time from 1990 to 2018.

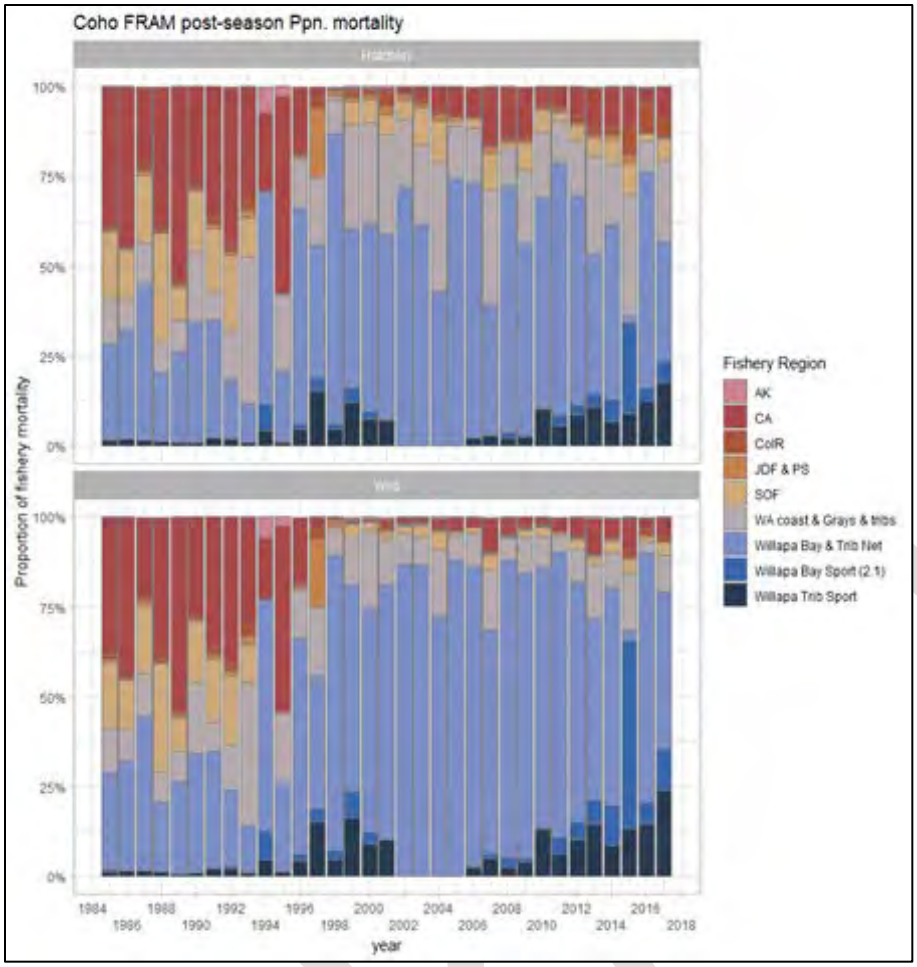


Figure 20. The proportional coho post season mortality rate estimates for unmarked and marked fish generated from FRAM models for 1984 to 2018.

Hatchery and wild coho historically have had a high proportion of fishing impacts observed from Canadian fisheries. In the late 1990's and early 2000's, Department staff observed a shift in the impacts from Canada to Willapa Bay and tributary net fisheries. However, in the last decade, agency staff have observed a recent increase in the percentage of impacts attributed to sport fisheries, particularly Willapa tributary sport, with impacts from non-Willapa fisheries, generally lower than those for Chinook salmon (Figure 20).

6.1 Broodstock Management Objectives

Policy Citation- Broodstock Management Objectives: *Manage Coho salmon with the following designations and broodstock management strategies:*

	North/Smith	***Willapa***	***Naselle***
Designation	*Primary*	*Primary*	*Stabilizing*
Broodstock Strategy	*No Hatchery Program*	*Integrated*	*Integrated*

Coho salmon returning to all other watersheds will be managed consistent with a Contributing designation.

There are both normal and late-timed coho programs at Forks Creek and Naselle hatcheries, both of which have a broodstock management strategy of an integrated program. The Willapa River is managed for a "Primary" population designation and HSRG guidelines would be to manage for a PNI of $\geq$ 0.67 and for a pHOS of $\leq$ 0.30. The Naselle River is managed for a "Stabilizing" population designation and HSRG guidelines would be to manage for a PNI and pHOS no worse than current at the time of the policy implementation. The North River/ Smith Creek is managed for a "Primary" population designation. A small segregated co-op program has operated on the North River using Forks Creek coho; however, the pHOS level from this program is currently unknown. In order to reach these targets, the agency needed to implement management actions that would increase the number of natural-origin adults utilized as broodstock as well as decrease the proportion of hatchery-origin fish on the spawning grounds in the Willapa River (Table 30). These data show the estimated HSRG evaluation metrics for hatcheries within the Willapa and Naselle river basins for the four years prior to policy implementation (e.g. 2011-2014) in comparison to the four years encompassing phase one of the Policy (e.g. 2015-2018). The number of natural-origin fish used in broodstock at Forks Creek Hatchery decreased from an average of 14.8% (normal-run) and 22.8% (late-run) rate prior to policy implementation to 8.7% (normal-run) and 13.3% (late-run) in the years of policy implementation. Correspondingly, the estimated PNI for this program decreased with an average value of 0.37 (normal-run) and 0.46 (late-run) in the years prior policy adoption in comparison to the 0.17 (normal-run) and 0.23 (late-run) average value in the four years after the policy was adopted.

Table 30. Estimates of pHOS, pNOB, and PNI for Coho in the Willapa and Naselle Rivers from 2011-2018.

Year	Willapa River Forks Creek Hatchery (Normal Coho)			Willapa River Forks Creek Hatchery (Late Coho)			Naselle River Naselle Hatchery (Normal Coho)			Naselle River Naselle Hatchery (Late Coho)		
	Full Recovery			Full Recovery			Full Recovery			Full Recovery		
	pHOS	pNOB	PNI	pHOS	pNOB	PNI	pHOS	pNOB	PNI	pHOS	pNOB	PNI
2011	13.8%	14.4%	0.51	13.8%	11.2%	0.45	38.8%	0.6%	0.02	38.8%	0.0%	0.00
2012	10.3%	5.1%	0.33	10.3%	33.3%	0.76	29.4%	2.2%	0.07	29.4%	5.0%	0.15
2013	33.3%	16.6%	0.33	33.3%	11.7%	0.26	21.9%	8.5%	0.28	21.9%	19.7%	0.47
2014	55.7%	23.0%	0.29	55.7%	34.8%	0.38	40.4%	1.3%	0.03	40.4%	5.0%	0.11
Avg. 11-14	***28.3%***	***14.8%***	***0.37***	***28.3%***	***22.8%***	***0.46***	***32.6%***	***3.2%***	***0.10***	***32.6%***	***7.4%***	***0.18***
2015	45.8%	8.6%	0.16	45.8%	18.6%	0.29	85.1%	9.9%	0.10	85.1%	15.3%	0.15
2016	26.7%	16.2%	0.38	26.7%	12.8%	0.32	52.0%	4.9%	0.09	52.0%	6.0%	0.10
2017	57.1%	5.1%	0.08	57.1%	7.0%	0.11	45.2%	30.4%	0.40	45.2%	22.5%	0.33
2018	62.5%	4.7%	0.07	62.5%	14.6%	0.19	66.9%	3.4%	0.05	81.8%	11.3%	0.12
Avg. 15-18	***48.0%***	***8.7%***	***0.17***	***48.0%***	***13.3%***	***0.23***	***62.3%***	***12.2%***	***0.16***	***66.0%***	***13.8%***	***0.18***

The declines in pNOB and PNI were directly linked to challenging environmental conditions that adversely affected the natural populations in Willapa. Drought conditions impacted the region starting in 2014 and were extreme in 2015, resulting low flows and correspondingly high-water temperatures and generally poor rearing conditions, which limited natural-origin smolt out-migration from the watersheds. Additionally, coho stocks along the Washington coast were particularly hard hit by warm water conditions in the North Pacific known as the "blob" starting in late 2013 and continuing through 2015. In the Willapa River the average escapement to the spawning grounds between 2011-2014 was 8,514, while it dropped by 52.1% to 4,077 between 2015-2018. Spawner surveys including those for pHOS are much more challenging for coho salmon due to flow conditions during spawning, which can limit that ability to count redds and observe carcasses. As such, estimates of spawner abundance and pHOS do not have the same level of confidence for coho as they do for Chinook salmon.

6.1.1 Commissioner's Emphasis Question 28:

What is the working definition of a "Stabilizing" designation in this situation?

The definition of a "Stabilizing" population is that it provides the lowest significance to the recovery of the ESU and may not have ever been a large segment of the ESU population structure (LCRFB, 2010). This is further explained in section 4.8. The Policy designated that both the Willapa and North River/ Smith Creek are managed as "Primary" populations, while the Naselle River watershed is managed as Stabilizing. All other tributary systems consisting of the Bear River, Nemah River and Palix/ Niawiakum River watersheds are to be managed consistent with a "Contributing" population designation. The coho population designations implemented as part of the Policy (C-3622) appear to be based primarily on a policy decision and are not supported by a rigorous scientific analysis. The designation of "Stabilizing" for the Naselle is unlikely to be supported by a scientific review as this population historically would have been expected to have contributed rather significantly to the Willapa Bay abundance. Based on a six-year average (2013-2018) of escapement data, the North River/ Smith Creek population was the most abundant averaging 10,435 fish, followed by the Willapa River 6,249 fish and the Naselle River 5,493 fish. For the

"Contributing" populations, the Nemah River was most abundant 3.084 fish, followed by the Bear River 757 fish and the Palix/ Niawiakum River 547 fish. Based on the abundance alone of the North/ Smith Creek and Willapa River populations appear to warrant their "Primary" population designations. However, based on escapement alone the Naselle and Nemah rivers would likely be considered "Contributing" populations, while the Bear River and Palix/ Niawiakum River would be "Stabilizing" populations. Escapement is just one of the factors that should be considered in developing population designations and an analysis that considers abundance, viability, life history diversity and genetic uniqueness of the populations should be undertaken to develop scientifically defensible population designations.

6.2 Fishery Management Objectives

3) Policy Citation- Fishery Management Objectives: *The fishery management objectives for Coho salmon, in priority order, are to:*

d. Manage fisheries with the goal of achieving the aggregate spawner goal for Willapa Bay natural-origin Coho salmon. When the pre-season forecast of natural-origin adult Coho is less than the aggregate goal, or less than 10% higher than the aggregate goal, fisheries in the Willapa Bay Basin will be scheduled to result in an impact of no more than 10% of the adult return;

e. Prioritize commercial fishing opportunities during the Coho fishery management period (September 16 through October 14); and

f. Provide recreational fishing opportunities.

In order to conserve and restore natural origin coho within Willapa Bay, the Policy (C-3622) implements three main management objectives throughout the Willapa Bay watershed listed above in *3d-f*. The Policy directs the Department to manage coho fisheries within Willapa Bay to achieve the aggregate spawner goal for natural origin coho. With this, if the pre-season forecast of natural origin coho is less than the aggregate goal, or less than 10% higher than the goal, then fisheries managers will schedule fisheries in the basin to result in an impact of no more than 10% of the adult return. Department staff will also prioritize commercial fishing opportunities during the coho fisheries management period (September 16- October 14), while also providing recreational fishing opportunities.

Department staff utilize the Willapa Bay TAMM model, described in detail in Section 5.2, to assess the impact of fishery prosecution in relation to conservation and management objectives. The model incorporates historic encounters and harvest data generated from post-season run reconstructions to predict estimates of harvest, impacts, and total expected escapement. For Willapa Bay coho, the management objective is to manage to the aggregate natural spawner escapement goal of 13,600. This aggregate natural spawner goal was updated from 13,090 to 13,600 for use starting in 2017 based on the outcome of a stock recruit analysis, as described further in section 4.10 of this document. The stock recruit analysis is also attached in Appendix 3. The forecasted abundance of natural origin coho was higher than 110% of the management objective during preseason planning for salmon fisheries in Willapa Bay in the policy implementation years (2015 to 2018). Therefore, commercial and recreational fisheries were planned in a manner to meet the aggregate coho natural spawner escapement goal.

Table 31. Coho preseason expected escapement and postseason escapement estimates resulting from recreational and commercial fisheries from 2015 to 2018.

Year	Preseason	Postseason
Escapement Goal	**13,600**	
2015	26,795	10,790
2016	26,012	25,290
2017	20,719	9,091
2018	15,243	11,603
Average	***22,192***	***14,194***

Based on the Willapa Bay TAMM model utilized during the preseason planning process, described in section 5.2, commercial and recreational fisheries would be curtailed if the coho natural spawning escapement was not expected to be met. Historically, the natural origin coho spawner escapement goal in Willapa Bay was met in all years from 2000-2014, except in 2006 (Figure 21). On average, the preseason expected coho natural spawner escapement was 22,192 fish for the four years of policy implementation (2015-2018), 8,592 fish above the spawner escapement goal. However, even though fisheries in Willapa Bay during years of policy implementation were planned preseason to meet the aggregate spawner goal, postseason estimates of natural spawning escapement only achieved the natural origin escapement goal once in four years during that same timeframe (Table 31).

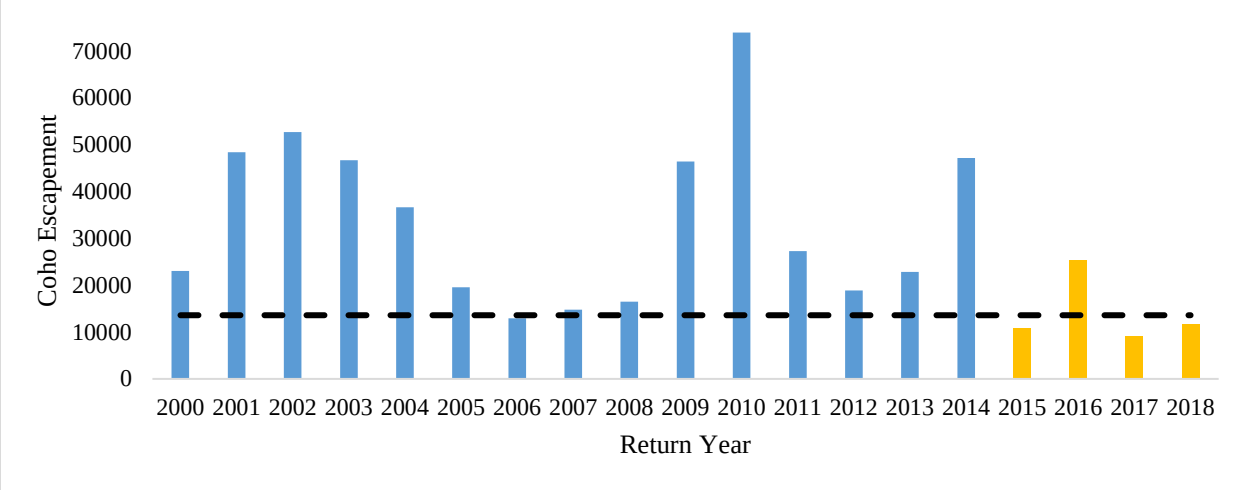


Figure 21. Estimates of Willapa Bay coho spawning escapement pre-policy (blue lines) and policy implementation (orange lines).

6.2.1. Commissioner's Emphasis Question #29:

Over the course of 2015-18, was the policy intent of this provision achieved, and if the "10% or less" features were used, what were the pre-season and post-season fishery impact rates for those particular years?

The intent of the Policy was achieved. During the policy years (2015-2018)**,** natural origin forecasts were greater than 110% of the natural origin escapement goal and therefore, the final fisheries planning models did not utilize the 10% provision.

6.3 Recreational Fisheries

Willapa Bay has seen an on-going decline in the total return of coho to the basin. This is not specific to Willapa Bay as the entire North Pacific has experienced significant decreases in coho returns the last few years. Per policy guidance, recreational fishing opportunity for coho is to be considered after commercial priority. Recreational fishing opportunity occurs in the Willapa Bay marine area 2-1 and freshwater systems throughout the basin. The 2010-2011 marine area fishery was the only season where the retention of unmarked coho was prohibited and no retention was allowed due to low preseason forecasted abundances. Since 2011, conservation and management objectives have allowed for varying levels of retention of unmarked coho in both the marine and freshwater fisheries across Willapa Bay.

Historically, coho harvest in Willapa Bay recreational fisheries has occurred predominantly in the freshwater systems, except in 2014 and 2015, when the marine area fishery harvested more coho (Figure 22). Prior to policy implementation (2011-2014), the adult salmon bag limit was three fish in both the marine and freshwater recreational fisheries. Following policy implementation in 2015, the adult salmon bag limit increased to four fish. However, in 2017 and 2018, the marine fishery adult bag limit was reduced to three fish, while the freshwater adult salmon bag limit remained at four fish.

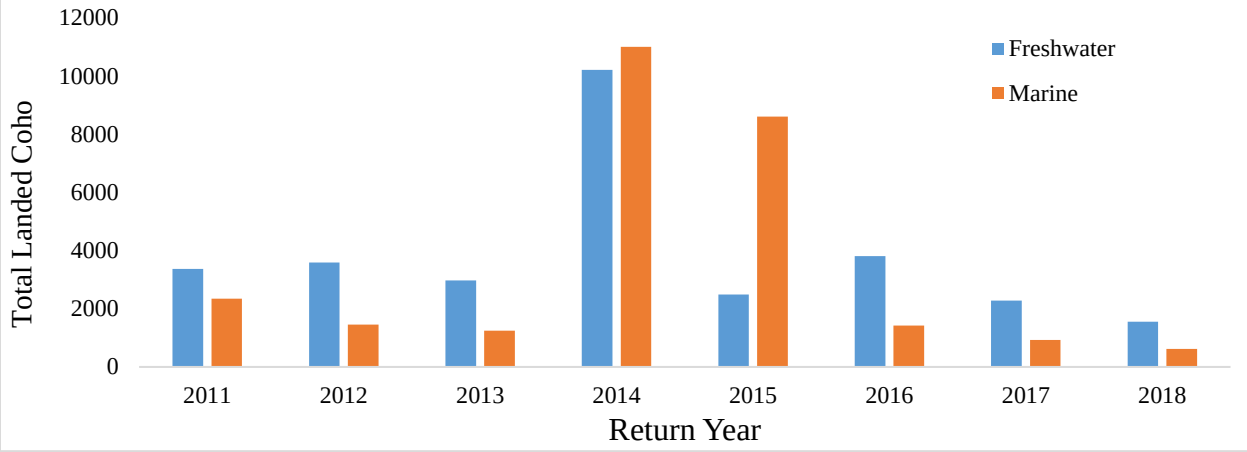


Figure 22. Willapa Bay recreational marine and freshwater coho harvest from 2011 to 2018.

During years prior to the policy (2011-2014), marine harvest averaged 4,017 coho, whereas during years of policy implementation (2015-2018) coho harvest in the marine fishery averaged 2,896 fish. During the same time periods from 2011-2014 and 2015-2018, freshwater coho harvest averaged 5,037 and 2,536 coho, respectively. These comparative harvest estimates represent a 28% decrease in marine coho harvest and a 49.7% decrease in freshwater coho harvest between years prior to the policy (2011-2014) and years during policy implementation (2015-2018). Therefore, the entire recreational fishery harvested an average of 9,054 coho during the four years pre-policy (2011-2014) and 5,432 coho during years of policy implementation (2015-2018). This is a 40.0% decrease in the total recreational coho harvest in Willapa Bay (Figure 22).

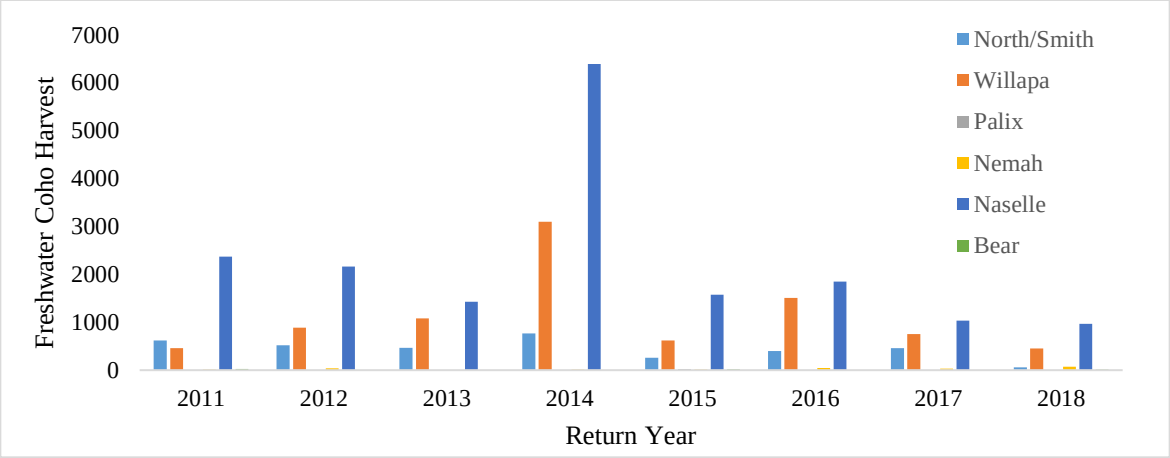


Figure 23. Coho recreational freshwater harvest throughout the six major systems (2011-2018).

For years prior to policy implementation (2011-2014), most of the harvest occurred predominantly in the Naselle and Willapa Rivers. The average harvest in the Naselle River in the years pre-policy (2011-2014) was 3,052 coho and 1,368 coho in the Willapa River. The average harvest in the Naselle and Willapa rivers during policy implementation (2015-2018) was 1,358 fish (56% decrease) and 834 fish (39% decrease), respectively (Figure 23). Those two systems combined make up 87.3% of the total landed coho harvest in recreational freshwater fisheries in Willapa Bay from 2011 to 2018. However, the total harvest of those two systems has declined by 50.4% from 17,616 coho landed in the pre-policy years (2011-2014) to 8,768 coho during years of policy implementation (2015-2018). Department staff report an overall decrease in freshwater harvest across all systems post policy (2015-2018). The continuous decline of coho abundances in Willapa Bay and across the North Pacific in recent years is evident in the marine and freshwater recreational fisheries throughout Willapa Bay. (Figure 23).

6.3.1 Question #30:
Over the course of 2015-18, were recreational fisheries for coho salmon closed for conservation purposes? If so, describe the commercial fishery opportunity in that same year.

In 2015, Department staff did make a closure to the coho recreational fishery in November. The in-season adjustment included closing both the marine and freshwater fisheries to all salmon fishing. After assurance of broodstock necessary for coho hatchery production objectives, recreational fisheries were reopened in freshwater systems where hatchery production occurs. The commercial fishery also incurred some adjustments, but these adjustments were due to conservation concerns for Chinook salmon, not coho, early in the fall 2015 season. Therefore, no in-season adjustments were made to the commercial fishery for coho conservation purposes in 2015 since there season had already been completed. The closure was for conservation purposes as described further in section 4.6 of this document; *In-season Management Actions.*

In 2017, the Department took in-season action for conservation of coho, specifically. The in-season adjustment included reducing the total salmon adult bag limit from two fish to one fish in the recreational freshwater and marine fisheries and required the additional release of unmarked coho for the remainder of the fishing season. The commercial fishery during the 2017 salmon season did not incur any coho restrictions or in-season actions as the timing of their fishery was conducted after the coho run size was downgraded.

6.4 Commercial Fisheries

Commercial fisheries were planned preseason to indirectly impact Chinook salmon and chum while targeting the harvest of coho. Coho opportunity is the priority for the commercial fishery, based on guidance described in Policy C-3622. Commercial fisheries were scheduled to target coho during the coho management period, September 16 through October 14. Retention of both natural and hatchery origin coho has been allowed in the commercial fisheries since 2011 and through the years of policy implementation (2015-2018). As previously mentioned in section 6.0, Willapa Bay has normal and late timed coho hatchery programs, and commercial fisheries have had the opportunity to fish for both.

While policy guidance provides coho priority to the commercial sector, the actual commercial coho harvest has declined in recent years (Figure 24). This decline in harvest has not always been the result of coho concerns or not meeting conservation and management objectives for coho. Given the mixed stock nature of the fishery, some of the reduced coho harvest by the Willapa Bay commercial fishery can be explained by other in-season management actions taken for Chinook salmon or chum that affected the commercial fleets ability to harvest coho.

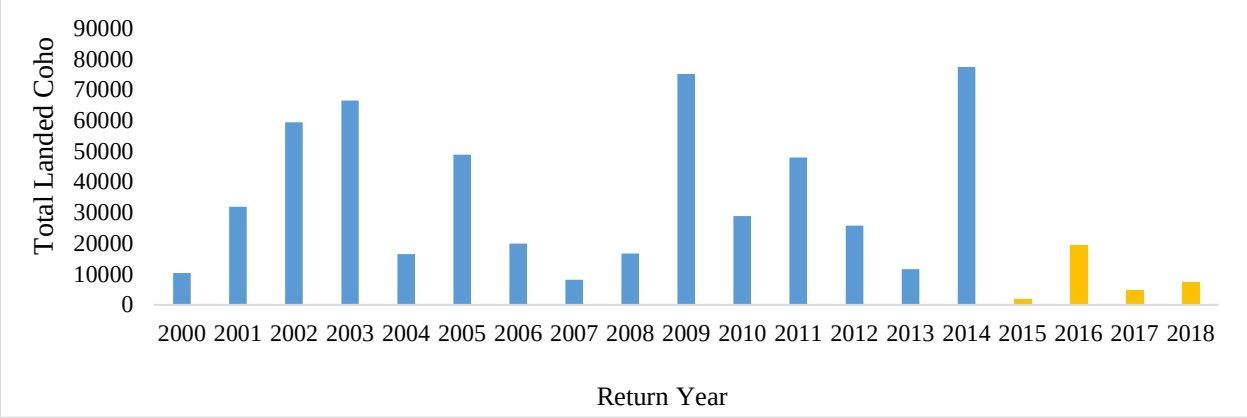


Figure 24. Total landed coho harvest in Willapa Bay commercial fisheries pre policy (blue lines) and during policy (orange lines).

The total landed harvest of coho in the commercial fishery has varied widely from 2011 to 2018. The total harvest has ranged from a high of 77,475 coho in 2014 to a low of 1,926 coho in 2015. Pre-policy (2011-2014), the commercial fishery harvested an average of 40,701 coho, while in comparison only harvested an average of 8,280 coho during years of policy implementation (Figure 24). This results in a 79.7% decrease in the total harvest of coho in the Willapa Bay commercial fishery since 2011. The development of more robust in-season management tools to update the run size has enabled fishery managers to effectively target coho when they are abundant and apply adaptive conservation measures in years when preseason abundances or actual in-season returns appear low.

6.5 Hatchery Production

The production of coho smolts from Willapa Bay hatchery facilities has remained relatively stable from 2011 to 2018. On-station releases of hatchery coho in Willapa Bay have been produced from Forks Creek and Naselle River hatcheries since 2008. Nemah Hatchery did contribute on average 570,000 coho smolts from 1990 to 2007, but that program was discontinued after the 2007 brood year. Both Forks Creek and Naselle River hatcheries have normal and late timed programs. The normal timed coho run timing typically occurs from September through October, whereas the late timed coho program run timing

typically starts in November and runs through January/February. The coho production goal from 2011 to 2018 brood years for Forks Creek Hatchery was 300,000 smolts annually and of those, 200,000 are normal timed and 100,000 are late timed. The coho production goal for the Naselle River Hatchery during that same timeframe was 1,400,000 smolts annually and of those, 1,200,000 are normal timed and 200,000 are late timed. There were only two years when coho broodstock needs were not met; 2014 and 2015 at the Naselle River Hatchery. In 2014, coho broodstock only reached 59.5% of the 1,400,000 objective. In 2015, the hatchery was able to collect 95.5% of the coho broodstock needed to meet the goal. Forks Creek Hatchery has met the coho hatchery broodstock goal from 2011 to 2017 (Table 32).

Table 32. Total coho smolts (late and normal combined) released from Willapa Bay Hatchery facilities from 2011 to 2018.

Brood Year	Forks Creek Hatchery	Naselle Hatchery
	Broodstock Goal	
	300,000	**1,400,000**
2011	337,693	1,410,260
2012	330,505	1,489,246
2013	319,069	1,441,950
2014	336,043	833,365
2015	313,354	1,336,528
2016	309,977	1,557,098
2017	310,214	1,415,969
Average	***322,408***	***1,354,917***

During this same timeframe (2011-2018), off-station coho releases that were the result of cooperative programs (CoOps) utilizing remote site incubation boxes (RSI's) operated by the Regional Fisheries Enhancement Group (RFEG) did occur. RSI boxes are placed in or near streams to incubate hatchery spawned salmonid embryos. Once the embryos have hatched and the juveniles emerge, the juveniles move into the stream to rear naturally. These programs were opportunistic and supplemented the on-station programs. Off-station releases for coho have been relatively consistent in recent years with only year to year variation due to availability of coho from the hatcheries. Willapa Bay CoOps programs release approximately 1,400,000 coho, with most of the total released occurring in either the Willapa or North River systems (Table 33).

Table 33. Willapa Bay coho cooperative (CoOp) and remote stream incubation (RSI) programs.

Cooperative/Remote Stream Incubation Programs	Coho Project	Plant Location
RFEG 10 Willapa Bay	200,000/500,000	Naselle River / Willapa River tributary
Willapa Bay Gillnetters Assoc.	250,000	Willapa River systems
Pacific County Anglers	200,000	Willapa River systems
Johnson Creek Project	50,000	Naselle River tributaries
Total	**1,400,000**	

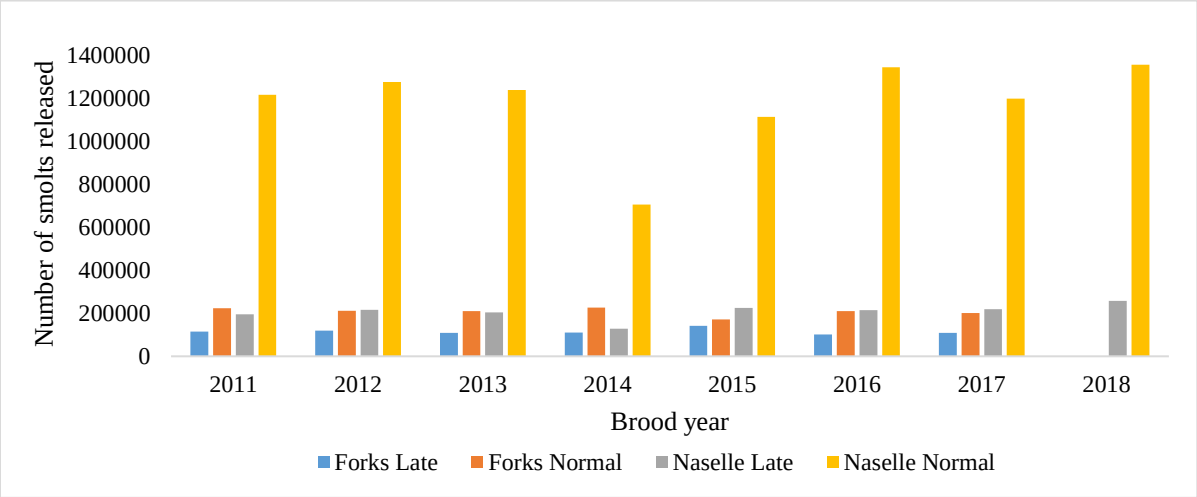


Figure 25. Coho smolts released (late and normal timed) from Forks Creek and Naselle Hatcheries from 2011-2018.

6.6 Stock Assessment

Coho stock assessment methods are similar to Chinook salmon, which are described in greater detail in section 5.6. The current coho escapement methodology in Willapa Bay relies on redd counts in weekly surveys of indexes and supplemental surveys during the peak spawn timing. Like Chinook salmon, carcasses recovered on the spawning grounds are used to separate the total escapement into hatchery and natural origin spawners (NOS and HOS). Normally, less coho carcasses are recovered as compared to Chinook salmon, therefore, this does add some uncertainty to estimates when breaking out proportions of hatchery and natural origin spawners.

Department staff walk or float index or supplemental reaches throughout the basin to identify redds, count live/dead fish, and obtain biological data from any available carcasses to aid in estimating natural origin spawner escapement. Overall, stream monitoring for coho remained relatively stable over the years. Prior to the Policy (C-3622), staff would only monitor the three main systems (North, Willapa, and Naselle Rivers) throughout the basin. Since the adoption of the Policy in 2015, staff increased coverage to include the six major systems within Willapa Bay (North River, Willapa River, Palix River, Nemah River, Naselle River, and Bear River). Because of the increased coverage since policy implementation, some

supplemental surveys were converted to index surveys, which resulted in an increase in the total mileage surveyed weekly. While new habitat wasn't explored with this increase, the data collected weekly has been essential to identify spawn timing for each basin and improve the accuracy and precision of our escapement estimates moving forward.

Willapa Bay coho are managed as an aggregate stock and have seen declines since implementing the Policy. Pre-policy, the average total escapement was 34,505 coho. Post-policy, the average total escapement was 18,388 fish, which is a 47% reduction from pre to post policy. The NOS escapement goal is 13,600 coho. The average coho NOS spawning escapement was 28,749 fish from 2011-14 (pre-policy) and 13,869 fish from 2015-18 (post-policy), a reduction of 52%. Coho escapement has not been achieved in three of the last four years; 2015, 2017, and 2018 (Figure 26). From 2000 to 2014, the coho natural escapement goal was achieved in all years, except the 2012 return year. Lastly, HOS were 5,736 coho pre- policy and 4,519 coho post-policy, a 21.2% decline. This decline in HOS escapement is a significantly smaller decline than that of the decline in NOS spawners mentioned above (Figure 26).

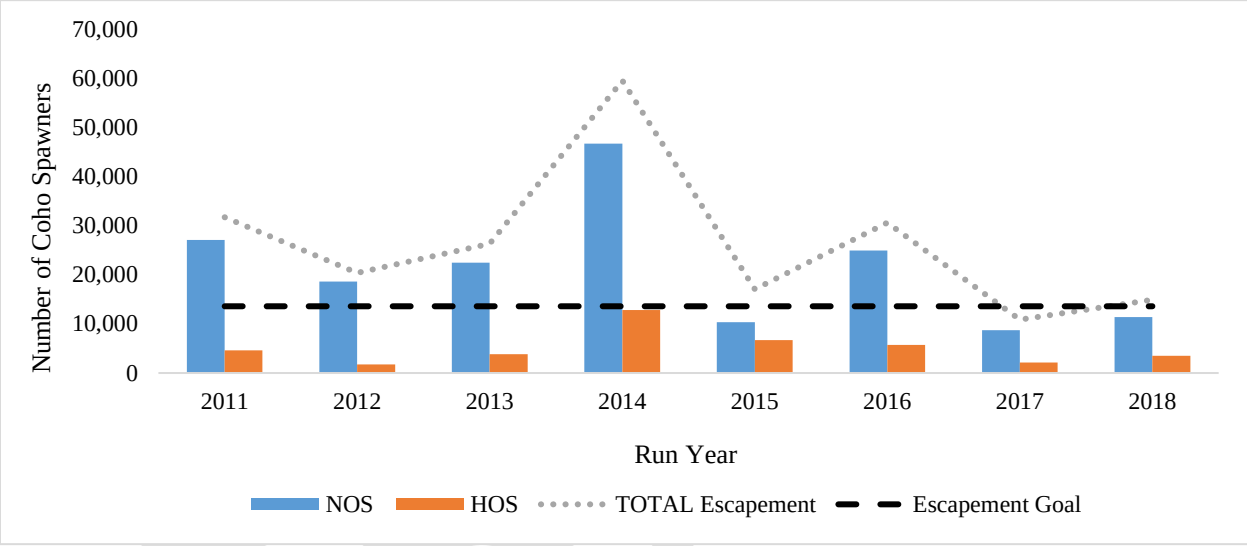


Figure 26. Willapa Bay coho NOS and HOS escapements from 2011-2018.

7.0 Chum Management

Historically, chum salmon are the most abundant of the naturally occurring salmonid species within Willapa Bay. Commercial catch data from 1913 to 1959 show the average proportional species composition of all salmonids landed within Willapa Bay commercial fisheries was made up of 65% chum salmon. That proportion has declined in modern times with chum salmon making up 43% of the total harvest of salmonids within Willapa Bay commercial fisheries from 1960 to 1991. Chum salmon migration through the marine area of Willapa Bay typically occurs in late September through November with peak migration timing occurring in October. Chum salmon can be found in all six major tributary river systems within Willapa Bay as well as in most sloughs and smaller tributaries. Chum typically spawn in the months of October and November and spawn in the lower reaches of these tributary systems but can move farther upstream if gradient and stream flows allow. Juveniles will emerge in the spring and spend very little time in freshwater before migrating to rear in saltwater environments (Suzumoto, 1992).

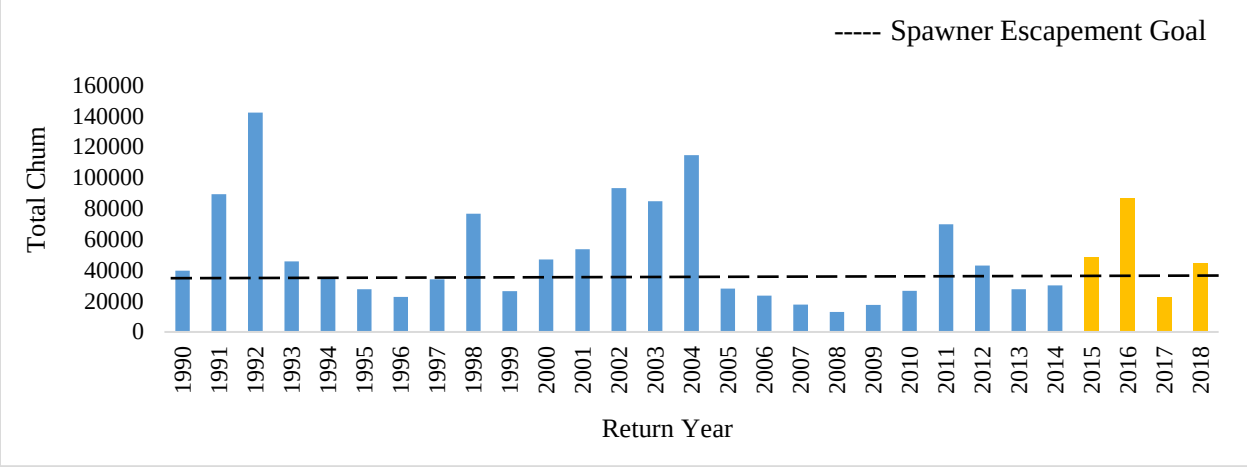


Figure 27. Willapa Bay chum total terminal abundances pre-policy (blue bars) and policy implementation years (orange bars).

The total terminal abundance of adult chum salmon returning to Willapa Bay over the last three decades have been highly variable. The average adult abundance of chum during that timeframe is 49,398 fish. Considering an escapement objective of 35,400 fish, a harvestable surplus of chum for commercial and recreational fishers has been available 52% of the time from 1990 to 2018 (Figure 27).

7.1 Broodstock Management

Policy Citation – Broodstock Management Objectives

Manage Chum salmon with the following designations and broodstock management strategies:

	North/Smith	***Palix***	***Bear***
Designation	*Primary*	*Contributing*	*Primary*
Broodstock Strategy	*No Hatchery Program*	*No Hatchery Program*	*No Hatchery Program*

Chum salmon returning to all other watersheds will be managed consistent with a Contributing designation.

Chum salmon hatchery programs are currently operated in the Willapa, Nemah and Naselle Rivers. All these programs are integrated conservation programs and are currently considered to be in the local adaption phase of recovery. However, recovery triggers for switching between phases have not been developed and this greatly limits the ability to assess the effectiveness or need for the programs as a conservation measure. An important next step for these programs will be to develop recovery phase abundance targets and evaluate the conservation need of the programs. If a conservation need is not necessary, then the Department should evaluate transitioning the programs to have a harvest goal. Additionally, due to the lack of a visual mark for hatchery chum and difficult flow conditions, pHOS cannot be estimated with any accuracy. A rough estimate based on the abundance of chum in supplemented versus non-supplemented areas provides a Willapa Bay chum pHOS of 0.03%.

7.1.1 Commissioner's Emphasis Question #31:
What is the working definition of a "Contributing" designation for the Palix River with no hatchery program in place?

With no hatchery program on the Palix River and no off-station releases of hatchery produced chum smolts into the Palix River system, metrics associated with a hatchery reform population designation of "Contributing" are assumed to be met. The "Contributing" population designation enforces the relative importance of chum spawning habitat in the Palix River system to the health of the Willapa Bay chum population overall.

7.2 Fishery Management Objectives

Policy Citation – Fishery Management Objectives

1. *The fishery management objectives for Chum salmon, in priority order, are to:*
    a. *Achieve the aggregate goal for naturally spawning Chum salmon and meet hatchery reform broodstock objectives (see bullet 3);*
    b. *Provide commercial fishing opportunities during the Chum salmon fishery management period (October 15 through October 31); and*
    c. *Provide recreational fishing opportunities. Recreational fisheries will be allowed to retain Chum salmon.*
2. *Fisheries will be managed with the goal of achieving the aggregate goal for Willapa Bay naturally spawning Chum salmon. Until the spawner goal is achieved 2 consecutive years, the*

maximum fishery impact shall not exceed a 10% impact rate and no commercial fisheries will occur in the period from October 15-31. If the number of natural origin spawners was less than the goal in 3 out of the last 5 years, the Department shall implement the following measures:

a. *The predicted fishery impact for Chum in Willapa Bay Basin will be scheduled to result in an impact of no more than 10% of the adult return.*

b. *When the Chum pre-season forecast is 85% or less of the escapement goal, the predicted fishery impact for Chum in Willapa Bay Basin will be scheduled to result in an impact of no more than 5% of the adult return.*

3. *The Department shall evaluate opportunities to increase hatchery production of Chum salmon. If Chum salmon hatchery production is enhanced, beginning as early as 2018, fisheries in the Willapa Bay Basin may be implemented with a fishery impact limit of no more than 33% of the natural-origin Chum salmon return.*

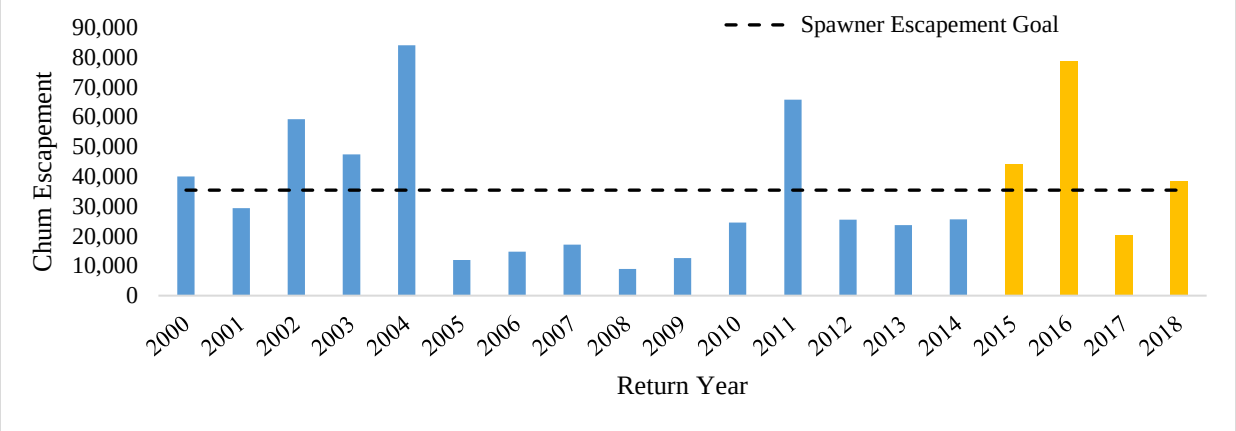


Figure 28. Estimates of Willapa Bay chum spawning escapement pre policy (blue lines) and during policy (orange lines).

Fishery management objectives described in the Policy call for Willapa Bay chum to be managed to achieve the naturally spawning chum escapement goal unless estimates of spawning escapement have been reached two years in a row or in three out of the last five years. If these criteria have not been reached, the total fishery impact was not to exceed 10% of the total terminal run. Secondly, unless the spawning escapement has been reached two consecutive years, commercial fisheries would not be permitted during the October 15 through October 31 timeframe. These conservation measures directed at chum salmon were consistent with actions described in the draft Willapa Bay Management Plan implemented in 2010.

During preseason planning for salmon fisheries in Willapa Bay, commercial and recreational fisheries were planned to not exceed a 10% total terminal impact to Willapa Bay chum in the aggregate. Also, commercial fisheries were planned to not open during October 15 through October 31, as the naturally spawning escapement goal had not been reached two consecutive years. In planning for fisheries in 2017 season, Willapa Bay chum had met the escapement goal two consecutive years but had failed to do so three out of the last five years. Thus, it would have been possible to schedule commercial fisheries during October 15 through October 31 timeframe if the total impact rate did not exceed 10% (Figure 28). Based on input received from commercial fishers during the preseason planning process, commercial fisheries were not scheduled during the timeframe listed above. Furthermore, commercial fisheries were planned to require the release of chum during coho directed fisheries. This was an additional conservation measure

supported by the commercial industry in the hopes of providing additional fish to the spawning grounds to help ensure harvestable abundances in future years. On average, fisheries were planned preseason to have an impact of 9.7% between 2015 and 2018. Postseason estimates of the impact rates resulting from recreational and commercial fisheries averaged 5.6% during the years of policy implementation (Table 34).

Table 34. The preseason prediction and post season estimate of the proportional total impacts to Willapa Bay chum resulting from recreational and commercial fisheries from 2015 to 2018.

Year	Preseason	Postseason
2015	10.0%	6.8%
2016	9.9%	6.6%
2017	10.0%	2.8%
2018	9.0%	6.4%
Average	***9.7%***	***5.6%***

7.2.1 Commissioner's Emphasis Question #32:
Over the course of 2015-18, were recreational fisheries for chum salmon closed for conservation purposes? If so, describe the commercial fishery opportunity in that same year.

Recreational fisheries have not been planned to be closed preseason or closed by emergency regulation in-season for chum conservation purposes, specifically, in any year during policy implementation. In 2018, preseason planned commercial fishing days scheduled to be prosecuted in November were closed by emergency regulation as in-season harvest information was exceeding preseason predicted values. The increased harvest was significant enough that exceedance of the 10% impact rate cap was likely. These fisheries were re-opened via emergency regulation when an in-season run size update become available. This run size update showed the actual run size was larger than the forecast prediction. Recreational salmon fisheries were closed by emergency regulation as a conservation measures to ensure attainment of conservation objectives for natural origin Chinook salmon and coho during the initial year of policy implementation. When enacted, these emergency regulations closed all recreational salmon fisheries in both marine and freshwater. Those in-season fishery management actions are discussed in detail in section 4.6 of the document.

7.2.2 Commissioner's Emphasis Question #33:
Over the course of 2015-18, was the policy intent of this provision, including 3.a and 3.b, achieved? If any of the fishery impact rate specifications were implemented 2015-18, what were the pre-season and post-season fishery impact rates for those particular years?

The reference to section 3.a in the Policy refers to a 10% impact rate cap to the total terminal adult return of chum, if escapement goals had not been reached in three out of the proceeding five years. The fishery rate specification of a 10% total impact cap to Willapa Bay chum was in place in all years from 2015 through 2018. This was due to the lack of meeting spawning escapement objectives three out of five years. Also, commercial fisheries were not planned to occur during the October 15 through 31 timeframe due to the lack of meeting the escapement objective two consecutive years. In planning for the 2017 fishery season, commercial fisheries proposed not fishing during the timeframe listed above due to the lack of consistency in reaching the management objective and in hopes of providing more fish to the spawning grounds as well as requiring the release of chum during coho directed fisheries to ensure future harvests. In all years of policy implementation, fisheries were planned as not to exceed a 10% total

impact. Post season estimates of the total impact rate were below the 10% management objective with an average of 5.6% impacts between 2015 and 2018 (Table 34).

The reference to provision 3.b of the chum fishery management objectives refer to an impact rate cap of 5% of the total terminal adult return of chum, if the preseason forecast was less than 85% of the escapement objective of 35,400 fish. This conservation measure was never employed during policy implementation as the preseason forecast estimates in all years exceeded the 85% threshold.

7.3 Recreational Fisheries

Prior to implementation of Policy C-3622, recreational fisheries in marine waters as well as freshwater had required the release of chum salmon from 2009 to 2014. During the 2014 salmon fishery, recreational fishers were allowed retention of chum via emergency regulation. In that year, CRC estimates of the harvest of chum indicate 50 fish taken in freshwater and no fish harvested in the marine area. Historically, the harvest of chum in recreational fisheries have been relatively minimal. In the time period from 1996 to 2008, the average recreational harvest of chum was 242 fish (Figure 29). Of that, much of the harvest occurs in freshwater with an average of 229 chum occurring in freshwater during the same time period (Figure 29). Chum salmon were required to be released by recreational anglers in 2007 due to low forecasted abundance.

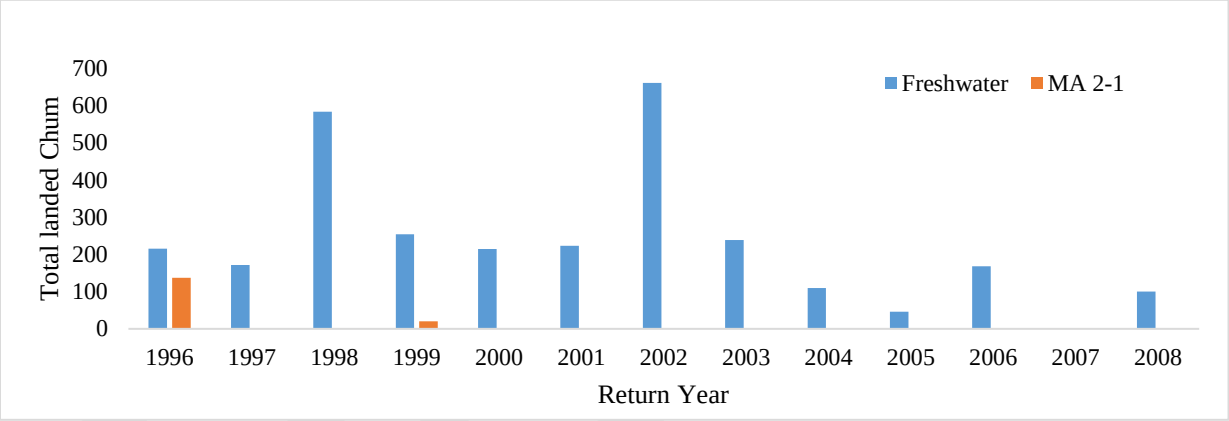


Figure 29. The estimated historical landed catch of chum in recreational fisheries by fishery sector from 1996 to 2008.

With implementation of Policy C-3622, recreational anglers were allowed retention of chum salmon beginning in 2015. Since the reinstatement of chum harvest in marine area 2-1 and freshwater tributaries in the Willapa Bay basin, recreational anglers have harvested an average of 108 fish from 2015 to 2018 (Table 35). The overwhelming majority of that harvest occurs in freshwater with estimates of chum harvest only occurring in marine waters in 2015. Estimates of freshwater chum harvest show fisheries in the Willapa, Nemah, and Naselle rivers account for 90% of the total freshwater harvest.

Table 35. The estimated landed catch of Willapa Bay chum in recreational fisheries in marine area 2-1 and freshwater from 2015 to 2018.

Year	Landed Catch	
	MA 2-1	FW
2015	9	172
2016	0	192
2017	0	40
2018	0	20
Average	***2***	***106***

7.4 Commercial Fisheries

Commercial fisheries were planned preseason to indirectly impact chum, while targeting the harvest of coho. The preseason fishery plans have employed both retention and non-retention strategies to ensure attainment of the management objective of a 10% impact rate cap. Commercial fisheries in 2015 and 2016 required the release of chum for the first three weeks of the fishery, spanning the month of September but then allowed retention until the chum closure window from October 15 through October 31. Chum retention was also allowed during commercial fisheries planned to be prosecuted during the month of November. Commercial fisheries planned for the 2017 fishery season were planned to require the release of chum salmon throughout the entirety of the season. This action was based on input received from commercial advisors as an additional conservation measure in hopes of attaining escapement objectives. Since escapement objectives had been met in 2015 and 2016, attainment of the escapement objective in 2017 would have allowed for some chum directed commercial fishing in successive years. For the 2018 fishery season, commercial fishers could retain chum in fisheries planned in September until the October 15 chum closure window but were required to release chum during the November fishery. Actual days fished in Willapa Bay commercial fisheries were impacted by in-season management actions in all the years of policy implementation. Only in the 2016 fishery season were those actions directed at ensuring attainment of management objectives for chum. More detailed discussion of specific in-season management actions is found in section 4.6 of this document.

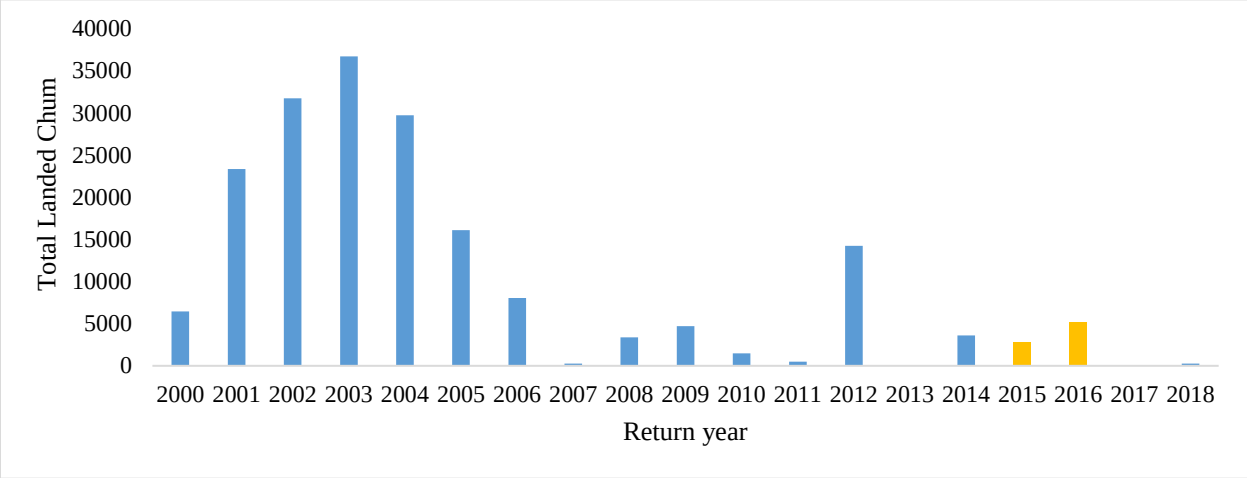


Figure 30. The total landed catch of chum salmon in Willapa Bay commercial fisheries pre policy (blue lines) and during policy (orange bars).

The total landed harvest of chum in commercial fisheries has been minimal. Only in 2016 was the total harvest greater than 5,000 fish, with a landed catch total of 5,183 fish. Since 2010 with the initiation of the 10% impact rate cap and the moratorium on commercial fisheries during the chum management period of October 15 through October 31, the total landed harvest has only exceeded 5,000 fish in two years, 2012 and 2016 (Figure 30). Given the relatively low price per pound of chum, averaging $0.58 from 2009 to 2018, total landed harvest of chum since 2006 has provided very little economic benefit to commercial fishers. The development of more robust tools to update the run size in-season and increased hatchery production of chum should enable fishery managers to more effectively target chum when they are abundant and apply adaptive conservation measures in lean years moving forward. Lastly, recent increases to hatchery production of chum in Willapa Bay facilities could contribute to more robust fisheries targeting chum in future years.

7.5 Hatchery Production

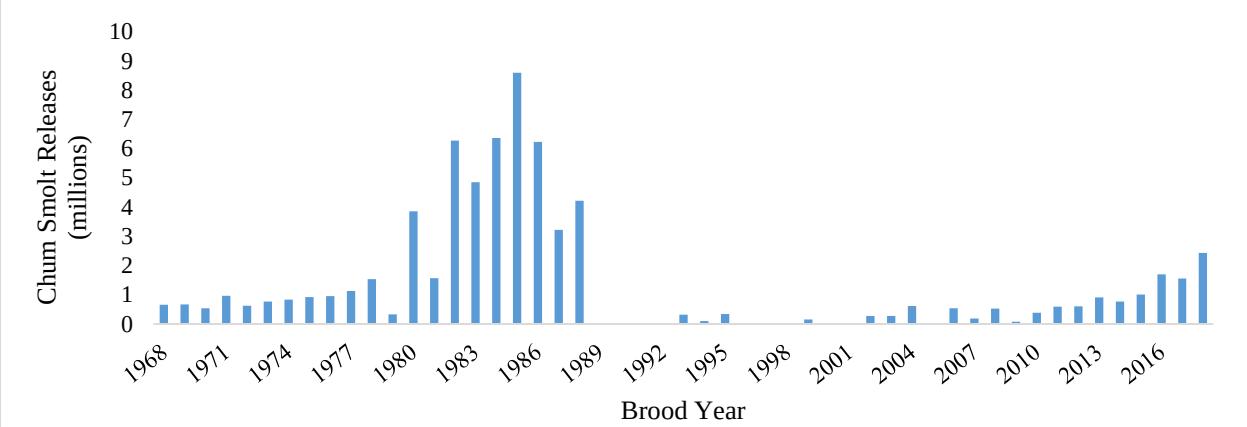


Figure 31. The total number of chum salmon released from Willapa Bay Hatchery facilities, including cooperative programs, from 1968 to 2018.

The production of chum salmon smolts from Willapa Bay hatchery facilities peaked in the 1980's with release of almost five million smolts on average annually. On station releases of chum salmon where then discontinued in 1988 until being reestablished in 2010. During the interim timeframe, some off-station releases that were the result of cooperative programs or remote stream incubation boxes (RSI) operated by the regional fisheries enhancement group (RFEG) did occur. These programs were opportunistic in nature, as without established on-station hatchery programs in place, the return and collection of broodstock to hatchery facilities was unreliable.

Beginning in 2010, on-station release of chum salmon was reinstituted with a smolt release goal of 900,000 fish annually. This production was to be split evenly between the Forks Creek, Nemah River, and Naselle River hatcheries. As had been a challenge with collecting broodstock for the cooperative programs, the lack of adult returns to hatchery facilities necessitated the need for active broodstock collection. This requires staff to acquire brood by hook and line capture methods directly on the spawning grounds. Those methods are still employed today. The smolt release target of 900,000 smolts was increased to 1.5 million smolts in 2016, which would again be evenly split between the three hatcheries within Willapa Bay. The goal was increased again in the 2018 brood year to a bay wide release of 2.5 million chum smolts (Figure 31). The production targets moving forward by facility are 500,000 for Forks Creek Hatchery, 1.5 million at Nemah River Hatchery, and 500,000 at the Naselle River Hatchery.

7.6 Stock Assessment

Staff utilize an area under the curve (AUC) method to estimate abundance of adult chum salmon spawning in the Willapa Basin. This method relies upon observation and enumeration of both live and dead chum salmon on the spawning grounds. Prior to 1991, ten different streams within the basin were surveyed for chum (Bear River, Ellsworth Creek, a tributary to Ellsworth Creek, Davis Creek, Williams Creek, Canon River, South Fork Willapa River, Trap Creek, Bitter Creek and Lower Salmon creek). Beginning in 1991, the number of systems surveyed for chum was reduced to encompass index surveys in three streams; Ellsworth Creek, Canon River, and Lower Salmon Creek. Spawning escapement estimates would then be generated for the three-index streams and expanded to a bay wide total using expansion factors developed through linear regression modeling. To continue to validate the model, data would be collected from the initial ten index streams every six years. This expanded survey coverage was conducted in 1996 and 2004 but has not been replicated since that time.

This method of using a small set of indexes and expanding those data by the historical proportional composition to the watershed level population is also employed to estimate spawner escapements in the Grays Harbor watershed. WDFW Science Division staff are currently engaged in a five-year study in Grays Harbor to understand the precision of these estimation methods.

Historically, from 1980 to 2014, estimates of chum salmon spawning escapement in Willapa Bay have reached or exceeded the spawning escapement goal 35,400 fish, 34% of the time. Estimates of chum salmon spawning escapements in the Willapa Bay watershed from 2000 to 2018 are included in Figure 28. There has been some improvement in recent years with Willapa Bay chum salmon meeting or exceeding their escapement objective eight times, or 42%, from 2000 to 2018. Since implementation of Policy C-3622, chum salmon estimates of spawning escapement have achieved the objective three out of four years, with an average of 45,411 naturally spawning fish during that time span. This value represents an increase of 129% over the average spawning escapement of 35,134 for the four years proceeding policy implementation, 2011 to 2014.

Table 36. Comparison of chum spawning escapement methods utilizing three stream index sites versus ten stream index sites for the years 1996, 2004, and 2018.

Year	Estimation Method		% Difference
	Three-Stream	Ten-Stream	
1996	20,011	20,708	103.50%
2004	84,021	72,923	86.80%
2018	38,582	35,441	91.90%

As mentioned above, in 1996 and 2004, the additional seven index surveys were conducted to validate and update the linear regression model used to expand spawning escapement estimates from the three index streams to a bay wide total estimate. The additional index surveys were also conducted in 2018 (Table 36). Evaluation of the more robust survey strategy utilizing ten index streams has produced estimates that on average are reduced from those produced by the three-stream method. Across the three years of data the ten-stream method has estimated escapements of 94% of the value estimated with the three-stream method. As mentioned above, the precision of either of these methods is unknown and it is likely that these values fall well within the range of management error. Lastly, utilization of either estimate method in 2018 would result in exceedance of the management objective of 35,400 naturally spawning chum.

8.0 Adaptive Management

8.1 Conduct Annual Fishery Management Review

Policy Citation – Adaptive Management Reviews: *The Commission will also track implementation and results of the fishery management actions and artificial production programs in the transition period, with annual reviews beginning in 2016 and a comprehensive review at the end of the transition period (e.g., 2019).*

Beginning in 2016, Department staff provided an annual briefing of the implementation and performance of policy guidance and objectives relating to the proceeding years fishery season. The briefings detailed key policy elements, policy guidance, and management objectives in relation to pre-season fishery planning and reported on post-season preliminary estimates of those conservation and management objectives. The briefings were provided annually at the February meeting of the FWC from 2016 to 2019. Due to severe weather in February of 2019, the 2018 fishery season briefing was moved to April of 2019. Copies of the briefing presentations are attached as Appendix 2.

8.1.1 Commissioner's Emphasis Question #8:
Over the course of the first four years of Policy implementation, has there been any adaptive changes to the management prescribed in the 2015 Policy as written? If so, describe the change and when it occurred, the rationale for the change, and if the change accomplished the objective.

There have been adaptive changes to the management prescribed in the 2015 Policy. During the 2018 annual briefing, staff asked the Commission to provide guidance on allocation of natural origin Chinook salmon impacts. Policy C-3622 prioritizes natural origin Chinook salmon impacts to the recreational sector to provide for "full and enhanced" recreational opportunity. The remaining impacts could then be utilized for commercial fisheries to access their priority species, coho and chum. Language in Policy C-3622 states the recreational impact rate was assumed to be 3.2% on natural origin Chinook salmon. With a 20% impact rate cap on Willapa and Naselle river natural origin Chinook salmon, the assumption during policy development was that there would be remaining impacts available for commercial fishery. With the implementation of Policy C-3622, recreational bag limits were increased to a four fish adult bag and areas historically closed for recreational Chinook salmon fishing were opened. Strong returns and good fishing conditions in 2015 and 2016 resulted in a recreational natural origin Willapa River Chinook salmon impact rate of approximately 15%. This is well above the 3.2% rate assumed during policy development. Preseason planning of fisheries in 2018 based on policy language would have incorporated a 6% set aside in commercial fisheries for use of alternative gear. This alternative gear set aside coupled with the higher than anticipated recreational impact rate of 15% on Willapa River natural origin Chinook salmon would have left no impacts available for commercial fishers to target coho. Without guidance on sharing of impacts, the commercial fishery in 2018 would have been limited to just the use of alternative gear.

By unanimous decision, the Commission provided guidance to staff for use in the 2018 preseason salmon fishery planning process that modified management objectives for fisheries in Willapa Bay. The general guidance could be summarized as that to achieve priorities or goals for one fishing sector should not result in eliminating opportunity for other fishing sectors. Staff was also to actively manage to not exceed the 20% impact rate cap on Willapa River and Naselle River natural origin Chinook salmon in 2018. This would be accomplished by instituting active monitoring of the recreation marine fishery to estimate effort and harvest/impacts in-season. Also, for 2018 fishery planning, staff was directed to explore reductions in the four fish adult bag limit and curtail high catch periods in June, July and August, if necessary. For commercial fisheries, a 9% impact rate cap would be used in preseason fishery planning. This impact rate

would include the 6% set aside for use of alternative gear. The remainder of the Policy was to remain in effect for the 2018 preseason planning process.

Willapa Bay fisheries in 2018 were planned to conform to the guidance provided. An active monitoring program was developed for marine area recreational fisheries, which allowed for in-season estimates of both harvest/impacts and effort. Adult bag limits during Chinook salmon directed fisheries in both the marine area and freshwater were reduced from a four fish bag to three. Commercial fisheries were planned to have an impact of 9% on natural origin Chinook salmon. Overall, fisheries in Willapa Bay were estimated to have an 17.8% impact to natural origin Chinook salmon in the aggregate. The post season estimated impact rate for natural origin Willapa River and Naselle River Chinook salmon was 6.4% and 11.7%, respectively.

8.1.2 Commissioner's Emphasis Question #25:
What has been the staff understanding of the policy intent of this provision?

This question is addressed in this section as it relates to post season estimates of natural origin Chinook salmon mortalities presented during the annual Commission briefings. The provision referenced is item #7, the maintaining rebuilding trajectory provision, in the species-specific guidance for Chinook salmon in the policy. The provision states:

"If the postseason estimate (as presented at the annual Commission review) of aggregated natural-origin Chinook salmon mortality (impacts) exceeds the preseason projection, the Department staff shall make a recommendation to the Commission regarding an adjustment to the allowable impacts for the subsequent year. The recommendation shall be based upon the percentage by which the postseason estimate of impacts exceeded the preseason projection but may consider other factors such as the predicted abundance or other relevant factors."

The staff understanding of this provision is that if post season estimates of natural origin Chinook salmon mortality exceeded the conservation objective of 20% when presented at the annual Commission briefings, then staff would make a recommendation to the Commission to adjust or not adjust the allowable impacts for the subsequent year. This recommendation would be based on all the factors that led to an overage of the conservation objectives including environmental conditions, precision in forecasting, and precision in modeling fishery performance.

8.1.3 Commissioner's Emphasis Question #26:
What is an example of how this provision would have been implemented, and was it ever implemented 2015-18?

For the 2016 fishery season, the post season estimate of natural origin Chinook salmon mortality for Willapa River and Naselle River was 25.1% and 25%, respectively. These estimates were presented to the Commission at the annual review briefing in February of 2017. No adjustment to the subsequent years impact rate was recommended at this time. In reviewing the cause of the overage of the conservation objective, the overage was attributed to two factors; actual run size less than predicted and under estimation of impacts from the marine recreational fishery. The forecasted run size of natural origin Chinook salmon in 2016 was 3,261 fish with the actual run size estimate post season as 2,432 fish, 75% of the pre-season prediction. Marine recreational fisheries were predicted to impact 92 natural origin Chinook salmon, 2.8% of the total terminal run size. Post season estimates of the impact of marine recreational fisheries was 183 fish, 7.5% of the total terminal run size. With now having two years of data under Policy C-3622 and the changes to the management paradigm that resulted, staff would be able to more accurately model recreational fisheries moving forward to better reflect the fishing power of the recreational fleet and adjustments to the subsequent years impact rate were not needed to maintain rebuilding of this stock.

8.2 Evaluation of Fishery Management Tools

Policy Citation – Adaptive Management Element #1: *The Department shall annually evaluate fishery management tools and parameters and identify improvements as necessary to accurately predict fishery performance and escapement.*

As part of the preparation for the pre-season salmon fishery planning process, commonly referred to as North of Falcon (NOF), Agency staff compile the data necessary to seed the models used to predict fishery performance and escapements. This includes finalization of previous years' run reconstructions with final harvest and impact rates as well as both spawning and hatchery escapement data. This allows staff to utilize data from more recent years to predict fishery performance to account for changes both ecological and to the management paradigm resulting from policy changes.

8.3 Improve In-season Management

Policy Citation – Adaptive Management Element #2: *The Department shall develop, evaluate, and implement fishery management models, procedures, and management measures that are projected to enhance the effectiveness of fishery management relative to management based on preseason predictions.*

As discussed in section 4.3 of this report, staff have developed multiple new management tools to enhance the in-season management of fisheries in Willapa Bay. These tools include an in-season update model for coho abundance, spawning escapement estimators using historical run-timing information to predict spawner abundance from real time values, genetic analysis of natural-origin Chinook salmon to assess stock composition in marine area fisheries, and a CWT based analysis used to assess the harvest contribution of hatchery fish to marine area fisheries. These new tools have increased the ability to utilize in-season information in comparison to pre-season predicted values to make in-season adjustments to fisheries to ensure attainment of conservation and management objectives. A discussion of in-season management actions is included in section 4.6 of this report.

8.4 Review Spawner Goals

Policy Citation – Adaptive Management Element #3: *The Department shall review spawner goals to ensure that they reflect the current productivity of salmon within the following timelines:*

d. Chum: September 1, 2016

e. Coho: January 1, 2016

f. Chinook salmon: January 1, 2020

The current spawning escapement goal for Willapa Bay chum salmon is 35,400 fish. The Department has not evaluated this spawner objective. The methodology employed to estimate the number of fish on the spawning grounds in discussed in Section 7.5 of this document and is similar in nature to the method utilized to estimate chum spawning escapement in the Grays Harbor Basin. Beginning in 2016, the Science Division of WDFW undertook a 5-year study to evaluate the accuracy and precision of the method used to estimate the spawning escapement. With questions as to the accuracy and precision of the current method, staff are awaiting the outcome of this study before proceeding to conduct a stock recruit analysis of Willapa Bay chum salmon.

A stock recruit analysis of the Willapa Bay coho stock was completed by Dr. Robert Kope and accepted by PFMC in 2015. The analysis suggested a naturally spawning escapement goal of 17,200 fish for the Willapa Bay stock. The analysis includes years prior to onset of mass marking of hatchery produced coho. Therefore, the goal is described as "naturally spawning" coho, which would include both hatchery and wild fish. Using origin composition data for the years analyzed in the stock recruit relationship, 79% of

the naturally spawning aggregate was made up of wild coho. Applying this value to the 17,200 naturally spawning coho goal, equates to 13,600 natural origin coho. The natural origin escapement goal was adjusted from the initial 13,090 natural origin fish to 13,600 natural origin fish beginning with the 2016 return year. A copy of the "Status Determination Criteria for Willapa Bay Natural Coho" can be found in Appendix 3.

A stock recruit analysis of Willapa Bay fall Chinook salmon was completed in 2020. A draft summary of this analysis in included as Appendix 1 of this document. Run reconstruction data from brood years 2000 to 2013 was used to examine spawner-recruit relationships on both an aggregate and sub-basin scale. As mentioned previously, mass marking of hatchery produced Chinook salmon produced from Willapa Bay facilities began with the 2006 brood year. As such, this analysis utilizes brood year run reconstructions prior to returns from marked Chinook salmon. Therefore, some uncertainty exists as to the precision in estimates of origin composition utilized in the analysis. The spawners-at-replacement value, or the threshold above which additional spawners would not be expected to produce additional recruits, for Willapa Bay Chinook salmon in the aggregate was estimated at 3,967 fish. This value is slightly below the current spawning escapement goal of 4,353 fish. Similarly, utilization of the same method and brood years broken down into three sub-basins resulted in spawners-at-replacement values estimated to be slightly below the current escapement goals. Due to the lack of understanding the precision of estimates of origin composition as well as the significant changes that have occurred to increase the scientific rigor of fisheries monitoring across the brood years used in the analysis, staff would not recommend a change to escapement goal at this time. Lastly, another confounding factor concerns environmental changes related to climate change that can affect the productivity of Chinook salmon within Willapa Bay in the future. For instance, analysis of instream flow data for the months of August and September show a reduction of 35% in average stream flow for the Naselle River in 2000 to 2019 compared to average stream flows measured during 1962 to 1981.

8.4.1 Commissioner's Emphasis Question #34:
What changes, if any, occurred as a result of this review? The analysis should provide the links to these reviews.

As discussed above, the review of the Willapa Bay chum escapement goal has not been completed and is awaiting results from an escapement estimate methodology review that is being conducted in the Grays Harbor basin. The Willapa Bay coho natural origin escapement goal review was completed in 2015 and the natural origin escapement goal was adjusted from 13,090 to 13,600 in return year 2016. The report of this analysis of escapement objectives that was submitted to the Salmon Technical Team (STT) can be found in Appendix 3.

8.5 Comprehensive Hatchery Assessment

Policy Citation – Adaptive Management Element #4: *The Department shall complete a comprehensive review of the hatchery programs in the Willapa Bay region by June 2016. The review shall identify the capital funding necessary to maintain or enhance current hatchery programs, identify changes in release locations or species that would enhance recreational and commercial fishing opportunities, identify improvements or new weirs to increase compliance with broodstock management, and the use of re-use water systems, water temperature manipulation to increase production hatchery capacity*

Agency staff delivered a briefing that reported the results of a comprehensive assessment of Willapa Bay hatchery facilities in August of 2016. The briefing provided background information, current production levels and opportunities, and infrastructure needs of the three Willapa Bay hatchery facilities. The presentation also covered issues related to hatchery reform for Willapa Bay salmonid production levels. A copy of the Agency's presentation to the FWC can be found in Appendix 4 of this report.

Prior to development of Policy C-3622, the Forks Creek Hatchery had begun a phased renovation. In 2014, upgrades to facility operations included rebuilt adult holding, trapping, and sorting infrastructure as well a completely rebuilt pollution abatement ponds. The briefing identified work that still needed to be completed in successive phases as upgrades to pump intake, removal of the siphon intake and adjacent barrier dam, upgrade of the in-stream Fork Creek weir, and replacement of the water supply lines and raceways. As of January 2020, the upgrades to the pump intake and in-stream weir have been completed, while the removal of the siphon intake and barrier dam is currently on-going. The remainder of the work is to be completed in successive phases pending funding.

The Naselle River Hatchery was undergoing a renovation evaluation with a final report sent to the Office of Fiscal Management (OFM) in June of 2016. The report recommended a complete rebuild of the Naselle River Hatchery was necessary for continued operation of the facility. This rebuild would be done in phases to facilitate continued operation of the facility during construction. Funding for first phase of construction was included in the 2020-21 biennium. Currently, the Agency is accepting bids for the work and is scheduled for completion by October of 2021. Work included in the first phase is replacement of supply lines, settling ponds, and water distribution tanks. The second phase of construction would begin in the 2022-23 biennium pending funding and would include replacement of the water intakes, adult holding, trapping, sorting, and replacement of the in-stream temporary weir structure.

As noted in the Agency's briefing, the Nemah River Hatchery has significant infrastructure needs. Most critical is the need to evaluate the possible replacement of the bridge that is the only access to the hatchery facility. The Agency recently received approval to begin this evaluation. Outstanding infrastructure needs for repair or possible replacement include in-stream weir, water intakes and supply lines, adult trapping and holding, and rearing raceways. A renovation evaluation is currently scheduled for the 2022-23 biennium pending funding. Recent environmental conditions such as stream flows and water temperatures in the months of August, September, and October severely hamper facility operation with the current status of hatchery infrastructure.

Current production levels and issues with broodstock management in relation to hatchery reform are discussed in detail in Section 5 for fall Chinook salmon, Section 6 for fall coho, and Section 7 for fall chum. Willapa Bay watershed level broodstock management issues identified in the assessment include improving integration rates of natural origin broodstock to mitigate for domestication effects associated with hatchery production, the number of hatchery fish spawning naturally, increased monitoring and evaluation of hatchery programs, and impacts associated with hatchery/wild fish interaction.

While the briefing included significant challenges in the operation of Willapa Bay hatchery facilities, there are some opportunities for improvement and increased production given the work completed on hatchery infrastructure since policy implementation. The assessment briefing covered opportunities for increased or additional hatchery production of chum and spring Chinook salmon.

Benefits of increased production of chum salmon, as historically they were the most abundant of the naturally occurring salmon species in Willapa Bay, include the low cost and lack of significant rearing space needed given their release timing. There could be opportunities to partner with non-governmental organization (NGOs) for increased chum production including the use of off-station rearing and release. Chum salmon have been documented to be a prey base for Chinook salmon and coho and could provide productivity benefits to those species within the bay.

Spring Chinook salmon was an additional salmon species identified as a possible opportunity for production in Willapa Bay hatcheries. Spring Chinook salmon are not native to Willapa Bay so given their current run and spawn timing, there may be limited impacts to native species. Spring Chinook

salmon would provide opportunity for harvest in spring and early summer fisheries. Also, like chum salmon, there could be opportunity for outside collaboration in the collection of broodstock, rearing, and release of hatchery produced fish. For the 2018 brood year, approximately 500,000 spring Chinook salmon smolts were transferred to the Forks Creek Hatchery for release in 2019 as a trial program. Future release of spring Chinook salmon into Willapa Bay would be dependent upon the availability of eggs from the Cowlitz Hatchery Complex. Shortages of spring Chinook salmon broodstock in the 2019 brood year prevented any planned releases in 2020.

8.5.1 Commissioner's Emphasis Question #35:
What are the most significant results of this review? The analysis should provide the link to this review.

Detailed discussion of the comprehensive hatchery assessment of the Willapa Bay facilities is discussed above and a copy of the staff presentation is included in Appendix 4.

8.6 Ocean Ranching Report

Policy Citation – Adaptive Management Element #5: *The Department shall complete by January 2016 a comprehensive review of opportunities and constraints to implement ocean ranching of salmon in Willapa Bay.*

The ocean ranching report was delivered by staff to the FWC during the June 2016 meeting. The briefing presentation contained an overview of background information with descriptions and overview of ocean ranching programs conducted around the world. The briefing also covered the applicable RCW's and the potential benefits and concerns associated with operating ocean ranching programs. A copy of the Agency's presentation to the FWC can be found in Appendix 5 of this report.

The term "ocean ranching" can have a broad definition. It can be defined as the cultivation of marine organisms under controlled conditions. The use of this definition can imply that current WDFW hatcheries could be considered as ocean ranching programs. In 2008, at the International Symposium on Stock Enhancement and Sea Ranching, a more detailed definition of ocean ranching was proposed. During this symposium, ocean ranching was defined as "*the release of cultured individuals into unenclosed marine and estuarine environments for harvest at a larger size input, grow, and take operations*" (Bell et al. 2008) Currently, there are more than 70 countries stocking over 180 marine species in some form of ocean ranching. Salmonids are the most widely stocked group of fish.

The staff presentation on ocean ranching identified benefits and constraints with this activity in Willapa Bay. The biggest constraint is private ocean ranching for profit is not authorized in Washington State. While certain non-profit state-private partnerships are authorized, the released smolts are property of the state. Other potential issues with this activity include impacts to wild fish and other natural resources, disease, degradation of water quality, water rights, and the ability to secure long term funding. Also, examination of ocean ranching programs has shown there is difficulty in these programs to be economically viable without significant financial support to establish the programs. Some of the benefits to ocean ranching programs include opportunity for increased harvest, provides alternatives in mixed stock fisheries, reduced government cost (if privately funded), and potential local community involvement. Ecological benefits could include increased marine derived nutrients from returning adults and released smolts could be a prey base for other naturally occurring species.

8.6.1 Commissioner's Emphasis Question #36:
What key opportunity and constraints were identified in this report? The analysis should provide the link to this review.

Detailed discussion of the ocean ranching report is discussed above, and a copy of the staff presentation is included in Appendix 5.

9.0 Economic Analysis

9.1 Recreational Fisheries

Historically, monitoring of recreational fisheries in Willapa Bay does not provide the data necessary to complete a robust direct analysis of the economic value of the fishery. As noted in earlier sections of this report, active monitoring of marine area recreational fisheries was initiated beginning in 2015. In the initial years, the objective of the monitoring program was to collect baseline data on species encounter rates and biological information of harvested fish. Beginning in 2018, robust active monitoring of the fishery included in-season estimation of harvest, impacts, and effort. The resulting estimates of total effort during recreational fisheries in marine area 2-1 was 9,254 anglers (Table 37). This estimate includes 1,038 estimated anglers participating in the fishery in July, when it was open under Marine Area 2 rules, and 8,216 anglers from August 1 through September 30 under Willapa Bay marine Area 2-1 specific rules. Using a value of $96.29 estimated as the economic impact per angler trip, 9,254 angler trips would result in an estimated economic impact of $891,068 for marine area recreational fisheries in 2018 (TWC Economics, 2008; Table 37).

While prior to 2018, direct estimates of the number of angler trips in marine area recreational fisheries is unavailable, data collected from both volunteer trip reports and dockside sampling can be used to produce an estimate of angler trips. By using the observed catch per unit of effort (CPUE), where effort is defined as an individual angler trip, and dividing by the total number of fish harvested, as estimated using the CRC, estimates of angler trips for marine area fisheries can be produced. These data can then be expanded by the economic impact per marine area angler trip value of $96.29 to produce an estimate of economic benefit (TCW Economics, 2008).

Table 37. Estimated number of angler trips and economic benefit in Willapa Bay marine area 2-1 from 2015 to 2018.

Year	Angler Trips	Economic Benefit
2015	21,453	$ 2,065,666.71
2016	27,961	$ 2,692,369.82
2017	21,500	$ 2,070,251.98
2018	9,254	$ 891,067.66
Average	***20,042***	***$ 1,929,839.04***

All monitoring of freshwater recreational fisheries is conducted using the CRC system. CRC data does provide annual estimates of harvested fish by river system but the corresponding CPUE data necessary to estimate the number of angler trips is unavailable for Willapa Bay freshwater tributaries. While surrogate data could be used to produce estimates, the observed differences in catch rates and species targeted by river system in Willapa Bay vary so as to make any estimation using surrogate data highly ambiguous.

9.1.1 Commissioner's Emphasis Question #5:

What is the number of angler trips during the four years of policy implementation in comparison to a four-year base period prior to the policy adoption, normalized to eliminate the variability of annual run sizes?

Table 38. The observed catch per unit effort (CPUE) of recreational fisheries from marine area 2-1 recreational monitoring programs in Willapa Bay from 2015-2018.

Year	CPUE
2015	0.468
2016	0.198
2017	0.235
2018	0.137
Average	***0.259***

Angler trips for the pre policy years (2011-2014) were developed by utilizing the average estimated catch per unit effort (CPUE) value of 0.259 observed from active monitoring programs of marine area fisheries in the policy implementation years (2015- 2018). For this analysis, effort is defined as an individual angler trip. The average CPUE value was then divided by the total CRC estimated harvest for each individual year to generate an estimate of the number of total angler trips occurring in marine area recreational fisheries (Table 38).

A comparison of the estimated number of angler trips during the four years of policy implementation to the four proceeding years and normalized by run size is included in the table below. The normalized value of 6.30 angler trips during policy implementation is an increase of 263% over the previous year's estimate of 2.39 (Table 39).

Table 39. The estimated number of angler trips in marine area 2-1 prosecuted in Willapa Bay from 2011 to 2018.

Year	Angler trips	Angler trips/ Run size
2011	14,388	2.72
2012	10,043	2.21
2013	5,328	2.01
2014	12,668	2.61
Average	***10,607***	***2.39***
2015	21,453	4.95
2016	27,961	11.49
2017	21,500	5.85
2018	9,254	2.91
Average	***20,042***	***6.30***

9.2 Commercial Fisheries

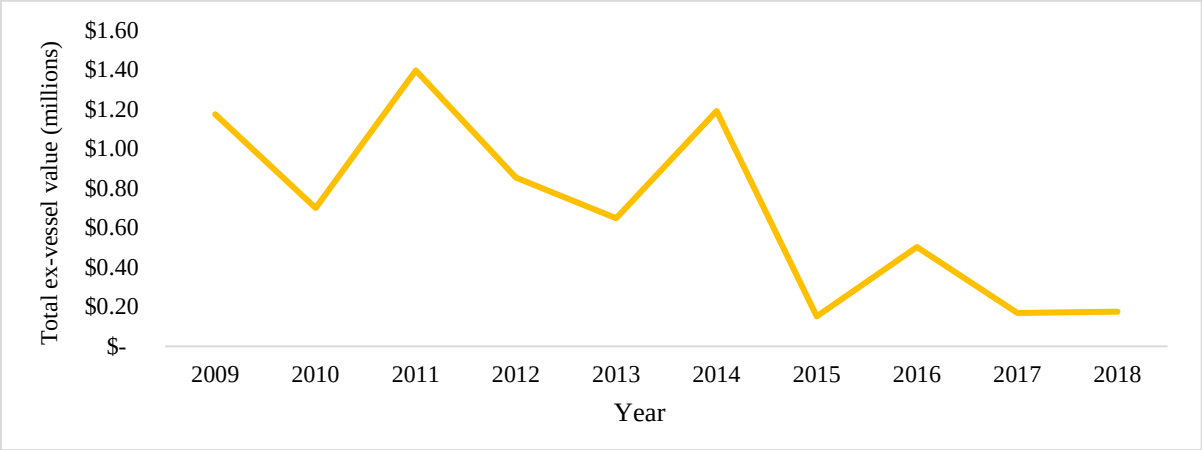


Figure 32. Total ex-vessel value of commercial fisheries prosecuted in Willapa Bay from 2009 to 2018. Economic values have been GDP adjusted to 4th quarter, 2019.

Ex-vessel values of commercial fisheries in Willapa Bay have experienced a sharp decline beginning in 2015 as compared to previous values (Figure 32). From 2011 to 2014, the total ex-vessel value of commercial fisheries averaged $1,022,009. During the phase one implementation of Policy C-3622 from 2015 to 2018, the average ex-vessel value was $250,042; this represents a decline of 76% compared to the four years before policy implementation (Table 40). Prioritization of the harvest of Chinook salmon to the recreational sector limited commercial opportunity directed at harvesting Chinook salmon. This played a role in the reduction in the total value of the fishery along with the lack of abundance of species (coho and chum) with harvest priority for commercial fisheries.

Overall, all three salmon species harvested by commercial fishery in Willapa Bay experienced a decline in the policy implementation years as compared to the four previous years (Table 40). As mentioned above, Policy C-3622 prioritized the harvest of Chinook salmon for recreational fisheries and prioritized coho and chum harvest for commercial fisheries. Also, space and time restrictions on when commercial fisheries could be prosecuted limited commercial fishery access to hatchery Chinook salmon. This resulted in the average ex-vessel value of harvested Chinook salmon of $87,881 during policy phase one as compared to $439,376 before policy implementation, a reduction of 80%. In contrast to other commercial fisheries prosecuted throughout the state, the price paid per pound to commercial fishers for harvested Chinook salmon is fairly stable across years. From 2009 to 2018, the GDP adjusted price per pound of Chinook salmon sold in Willapa Bay averaged $2.52 with a low of $2.07 in 2014 to a high of $3.12 in 2018.

Table 40. Ex-vessel value of commercial fisheries prosecuted in Willapa Bay by species from 2011 to 2018. Economic values have been GDP adjusted to 4th quarter, 2019.

Year	Chinook	Coho	Chum	Total
2011	$611,585.64	$781,760.11	$3,037.68	$1,396,383.44
2012	$346,734.49	$423,733.80	$83,112.01	$853,580.31
2013	$444,479.76	$203,129.73	-	$647,609.50
2014	$354,707.11	$815,174.59	$20,583.47	$1,190,465.17
Average	***$439,376.75***	***$555,949.56***	***$35,577.72***	***$1,022,009.60***
2015	$118,561.72	$21,560.76	$11,519.57	$151,642.05
2016	$92,792.48	$383,401.63	$26,662.95	$502,857.05
2017	$93,183.24	$76,603.86	-	$169,787.10
2018	$46,987.17	$126,861.01	$2,031.87	$175,880.05
Average	***$87,881.15***	***$152,106.81***	***$13,404.80***	***$250,041.56***

The ex-vessel value of harvested coho and chum in commercial fisheries have also experienced reductions in comparison the pre-policy levels. From 2011 to 2014, the ex-vessel value of harvested coho averaged $555,950. During the initial years of policy implementation, the average value was $152,107, or a reduction of 73%. The mixed stock nature of marine fisheries in Willapa Bay resulted in some loss of opportunity for commercial fishers in order to meet harvest control rules established for conservation of Chinook salmon. The reduction in ex-vessel value of coho was also exacerbated by the decrease in abundance of coho stocks throughout the Pacific Northwest that began in 2015. The value of chum harvested by the commercial fishery in Willapa Bay experienced a reduction of 62% when compared to the four years prior to policy implementation. Due to the lack of a harvestable surplus, chum was not legal to be retained in commercial fisheries prosecuted in 2013 and 2017 (Table 40). Similar to Chinook salmon, the price paid for coho and chum have been stable with an average of $1.82 and $0.58 paid for harvested coho and chum, respectively. From 2009 to 2018, the GDP adjusted range of price paid for harvested coho was $1.24 in 2014 to $2.22 in 2017. For chum the range was $0.42 in 2015 to $0.89 in 2011.

Ex-vessel value of the commercial fishery can then be expanded into total economic benefit by using an expansion factor of 2.24 as described in an economic analysis report conducted by TCW economics (TCW Economics, 2008). The estimated total economic benefit of commercial fisheries prosecuted in Willapa Bay decreased by 75% during the initial years of policy implementation as compared to the four previous years estimated value (Table 41)

Table 41. The estimated total economic benefit of commercial fisheries prosecuted in Willapa Bay from 2011 to 2018.

Year	Total Ex-Vessel Value	Total Economic Benefit
2011	$1,396,383	$3,127,899
2012	$853,580	$1,912,020
2013	$647,609	$1,450,645
2014	$1,190,465	$2,666,642
Average	***$1,022,010***	***$2,289,302***
2015	$151,642	$339,678
2016	$502,857	$1,126,400
2017	$169,787	$380,323
2018	$175,880	$393,971
Average	***$250,042***	***$560,093***

Lastly, as the economic return of participating in commercial fisheries in Willapa Bay has declined, as measured by total ex-vessel value of the fishery, the number of fishers participating has also decreased (Figure 33). Between 2000 and 2014, the average number of individual commercial fishery participants was 79 fishers. The average number of participants from 2015 to 2018 was 50, a reduction of 37% (Figure 33).

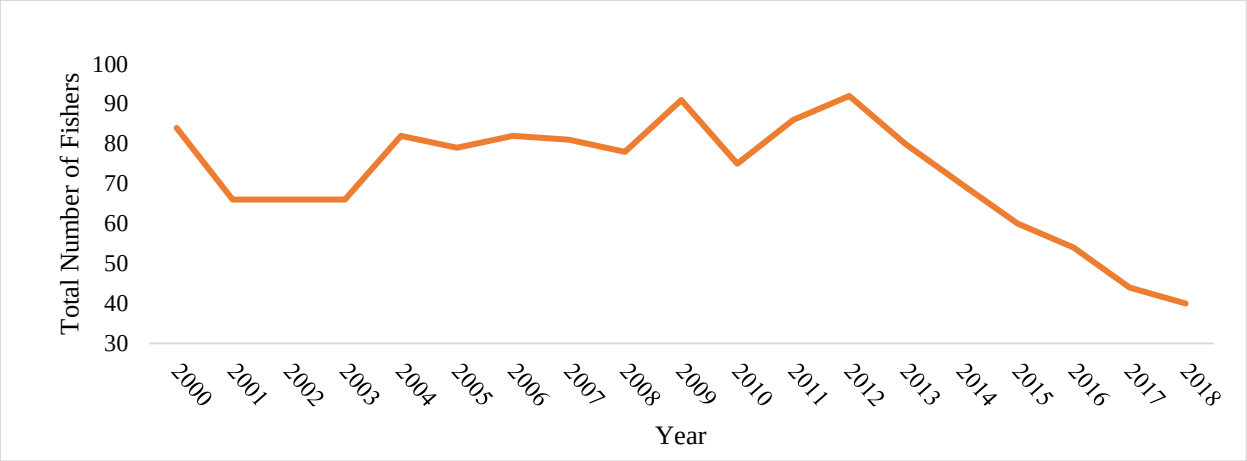


Figure 33. Total number of individual fishers (with landings) participating in Willapa Bay commercial fisheries from 2000 to 2018.

9.2.1 Commissioner's Emphasis Question #4:

What is the average ex-vessel value of the commercial fishery landings in the four years of policy implementation in comparison to a four-year base period prior to the policy adoption, normalized to eliminate the variations in annual run sizes and annual price per pound?

The total average ex-vessel value of salmon landed in commercial fisheries normalized by run size and by price per pound from 2011 to 2018 is reported in Table 42 below. The normalized ex-vessel value of all three salmon species harvested in Willapa Bay commercial fisheries saw dramatic reductions during policy implementation years compared to pre policy levels. Chinook salmon and chum harvest saw the greatest decrease with ex-vessel values reduced by 78% during policy implementation compared to pre

policy. The value of harvested coho was reduced significantly with an average pre policy estimate of $3.09 compared to an average value of $1.51 during policy implementation, a reduction in value of 51%.

Table 42. Ex-vessel value of salmon in Willapa Bay commercial fisheries normalized by price per pound and by run size from 2011 to 2018. All values GDP adjusted to 4th quarter 2019.

Year	Chinook	Coho	Chum	Total
2011	$5.22	$4.22	$0.05	$9.48
2012	$4.51	$3.42	$3.83	$11.76
2013	$4.79	$1.85	-	$6.64
2014	$4.57	$2.87	$1.18	$8.62
Average	***$4.77***	***$3.09***	***$1.69***	***$9.13***
2015	$1.22	$0.29	$0.57	$2.08
2016	$1.41	$2.48	$0.52	$4.42
2017	$1.05	$1.48	-	$2.53
2018	$0.60	$1.80	$0.06	$2.46
Average	***$1.07***	***$1.51***	***$0.38***	***$2.87***

Acknowledgments

This document could not have been completed without the help of so many people. Agency staff would like to extend thanks to several colleagues throughout the Department. Gary Marston from the H.E.A.T. unit for your contributions, Dan Auerbauch and Derek Dapp for your modeling efforts, Lauren Bauernschmidt from the habitat program for your collaboration and contributions, Dale Gombert for his extensive GIS skills, Raquel Crosier, Mark Baltzell and James Losee for your continued support and help with edits, Ron Warren for his continued support and leadership and lastly, Ryan Zimmer and the many Willapa Bay technicians who spent endless hours collecting and entering the data.

References

Appleby, A., Blankenship, H. L., Crampton, D., Currens, K., Evelyn, T., Fast, D., . . . Warheit, K. (2014). *An updated perspective on the role of hatcheries in salmon and steelhead management in the Pacific Northwest.* HSRG (Hatchery Scientific Review Group).

Bell, J. D., Leber, K. M., Blankenship, H. L., Loneragan, N. R., & Masuda, R. (2008). A New Era for Restocking, Stock Enhancement and Sea Ranching of Coastal Fisheries Resources. *Reviews in Fisheries Science*.

Ford, M. J. (2002). Selection in captivity during supportive breeding may reduce fitness in the wild. *Conservation Biology, 16*, 815 - 825.

Kope, R. (2014). *Status Determination Criteria for Willapa Bay Natural Coho.* Seattle, WA.

LCFRB. (2010, May). *Washington Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan*, Volume 1-2. Retrieved from Lower Columbia Fish Recovery Board (LCFRB): https://www.lcfrb.gen.wa.us/librarysalmonrecovery

Myers, J. M., Kope, R. G., Bryant, G. J., Teel, D., Lierheimer, L. J., Wainwright, T. C., . . . Waples, R. S. (1998). *Status Review of Chinook Salmon from Washington, Idaho, and California.* NOAA Tech. Memo, U.S. Dept. of Commer. Retrieved from https://www.nwfsc.noaa.gov/assets/25/7190_07042012_124647_Myers.et.al.1998-rev.pdf

National Oceanic Atmospheric Administration (NOAA) (1998, March 9). Federal Register. *Endangered and Threatened Species: Proposed Endangered Status for Two Chinook ESU's and Proposed Threatened Status for Five Chinook salmon ESU's.* , pp. 1-39.

Phinney, L. A., & Bucknell, P. (1975). *A catalog of Washington streams and salmon utilization.* Washington Department of Fisheries.

Suzumoto, B. K. (1992). *Willapa Fisheries Enhancement Project.*

TCW Economics. (2008). *Economic analysis of the non-treaty commercial and recreational fisheries in Washington State.* Sacramento, CA.

Weitkamp, L. A., Wainwright, T. C., Bryant, G. J., Milner, G. B., Teel, D. J., Kope, R. G., & Waples, R. S. (1995). *Status Review of Coho Salmon from Washington, Oregon, and California.* National Marine Fisheries Service.

Appendix 1. Willapa Bay Chinook Spawner-Recruit Assessment Overview

Dan Auerbach, Fish Management Division, WDFW Fish Program

October 19, 2020

Spawner-recruit (SR) relationships for natural origin Chinook salmon returning to Willapa Bay were examined in support of a broader effort to review and evaluate the WDFW policy on Willapa Bay fisheries management.

Willapa region staff have collected and compiled escapement, catch, and age composition data over many years. These data permit the reconstruction of Chinook brood years 2000-2013 for individual sub-basins as well as the bay as a whole. Fitting traditional Ricker spawner-recruit relationships to each of these brood reconstructions offers a data-driven perspective on recent productivity and supports a discussion of biologically meaningful escapement goals.

[Figure 1]

Across brood years, the average numbers of spawners and recruits varied by river system, with the smaller Nemah/Palix diverging from the two larger aggregates. Table 1 shows the arithmetic mean of spawners, recruits and recruits-per-spawner (R/S) over complete brood years (2000-2013). Note the Nemah/Palix average is closer to the other systems after 2003 but is affected by several larger values early in the series, as evident in the third and fourth rows of Figure 1. However, despite the distinct sub-basin parameter estimates associated with these run size differences, the sum of the system-specific reference points was very close to the value calculated for the aggregate Willapa Bay run.

Table 1: Average run size and productivity by system

	Spawners	Recruits	R/S
Willapa Bay aggregate	2719	3902	1.543
Willapa/North/Smith	1442	2041	1.514
Nemah/Palix	149	252	3.339
Naselle/Bear	1128	1608	1.675

The spawners-at-replacement (S_rep) is a reference point at the intersection between the fitted Ricker curve and the 1:1 line of recruits relative to spawners. It may be interpreted as a threshold above which additional spawners would not be expected to produce additional recruits. For the aggregate Willapa Bay run and for each sub-basin, the estimated S_rep values were slightly below the longstanding escapement goals (Table 2).

	Natural spawner estimated capacity	S_rep
Willapa Bay aggregate	4,353	3,967
Willapa/North/Smith	2,172	2,126
Nemah/Palix	328	263
Naselle/Bear	1,853	1,551

[Figure 2a – 2d]

Examining the brood years 2007-2013 underscores the importance of continuing to collect high quality data as the foundation for understanding trends in Willapa Bay productivity. Several consecutive years of increasing spawners in the Willapa/North and Naselle/Bear sub-basins were followed by consecutive declines after 2010. However, since 2013, the number of spawners has rebounded in the Willapa/North system but not in the Naselle/Bear. Understanding the relationship between the number of spawners and the number of fish returning from those broods depends on the ability to continue reconstructing runs and developing brood tables with additional high-quality data.

[Figure 3]

Instream flow is a critical factor affecting the productivity of Chinook salmon (Bergendorf 2002). Specifically, adult salmon are unable to reach spawning areas when low flows create shallow and/or warm water barriers that impede movement. Accordingly, the long-term trends in daily flows at two USGS streamflow gages on the Willapa and Naselle rivers were assessed to understand in-stream flow patterns relative to Willapa Bay Chinook salmon. At both gages, daily flows during August and September, when Willapa Bay Chinook characteristically re-enter freshwater, showed appreciable declines over a period of record from 1962 to 2019. For example, at the Naselle gage, the median daily flow in September decreased 35% from an average of 78 cfs during 1962-1981 to 51 cfs during 2000-2019. Again, maintaining a program of high-quality monitoring is fundamental to our ability to recognize and respond to changes in recruitment that may result from less water in the river when fish have historically returned to spawn.

[Figure 4a &b]

Work Cited

Bergendorf, D. 2002. The Influence of In-stream Habitat Characteristics on Chinook

Salmon (*Oncorhynchus tshawytscha*). Technical Report prepared for NOAA Northwest Fisheries Science Center, Seattle, WA.

Figure 1: Relationships between spawners and recruits for the Willapa Bay aggregate (first column), and the Willapa/North/Smith, Nemah/Palix and Naselle/Bear systems (second to fourth columns respectively). Row (a) illustrates the time series of spawners, row (b) depicts the recruits relative to spawners, row (c) shows the time series of recruits per spawner (rps), and row (d) illustrates recruits per spawner relative to spawners.

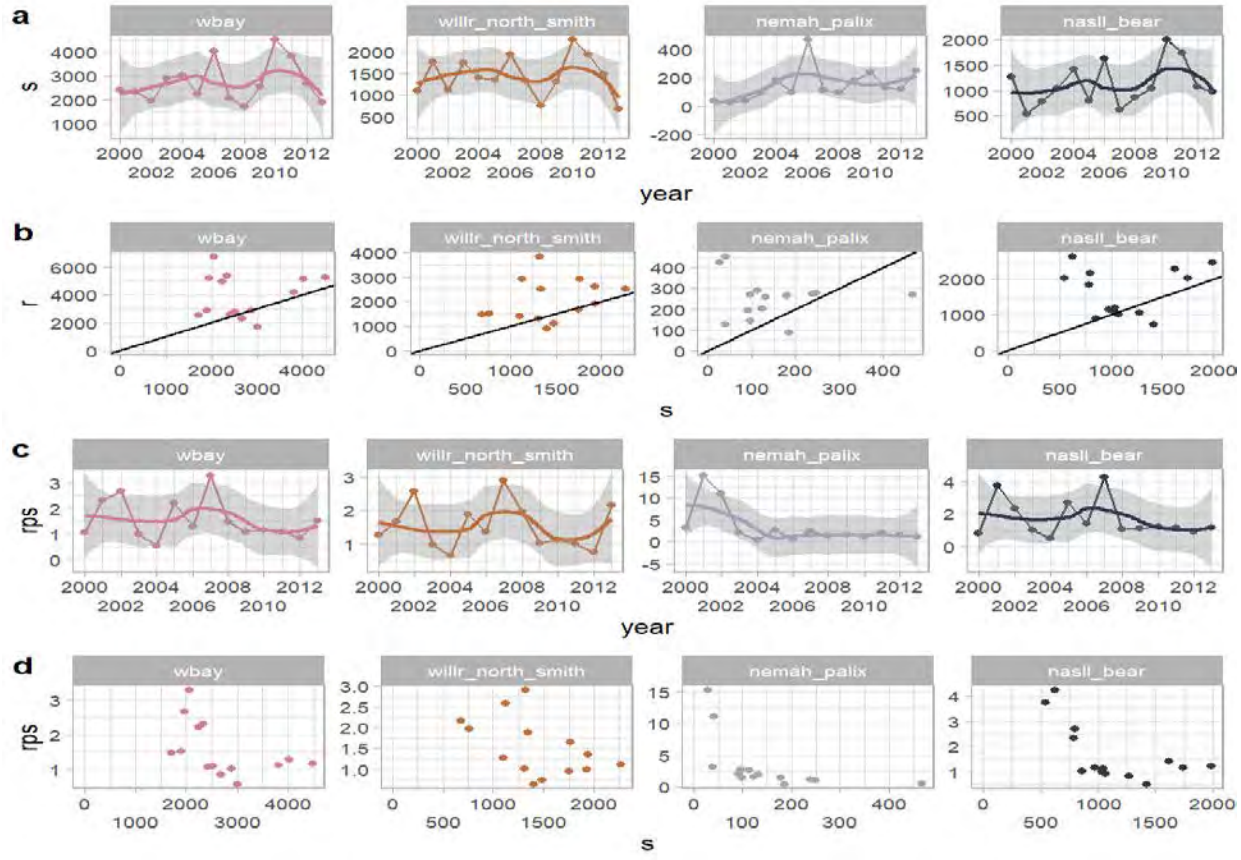


Figure 2a: Spawner time series (upper panel) and estimated Ricker spawner-recruit curves for the aggregate Willapa Bay run. The current natural spawner estimated capacity (solid black line) is shown relative to the fitted S_rep (dashed green line) and S_msy (dotted orange line). In the lower panel, the thick black curve shows the best-fit parameter estimates, with 100 bootstrapped fits illustrated as light grey curves and the full set of bootstrap S_msy estimates shown as short orange lines. These depict some of the uncertainty associated with reference points.

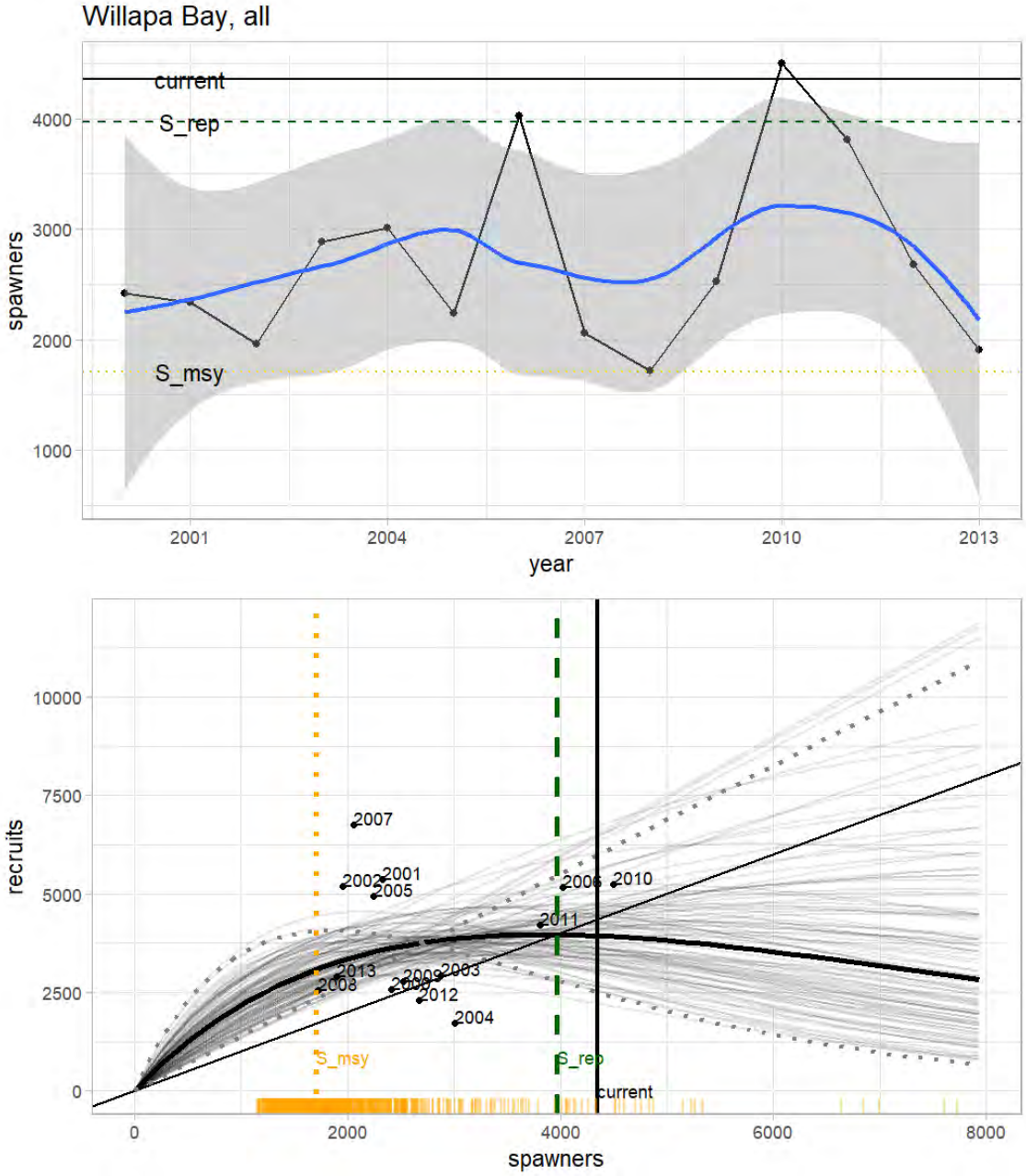


Figure 2b: Willapa & North River spawner time series (upper panel) and estimated Ricker spawner-recruit curves. The current natural spawner estimated capacity (solid black line) is shown relative to the fitted S_rep (dashed green line) and S_msy (dotted orange line). In the lower panel, the thick black curve shows the best-fit parameter estimates, with 100 bootstrapped fits illustrated as light grey curves and the full set of bootstrap S_msy estimates shown as short orange lines. These depict some of the uncertainty associated with reference points.

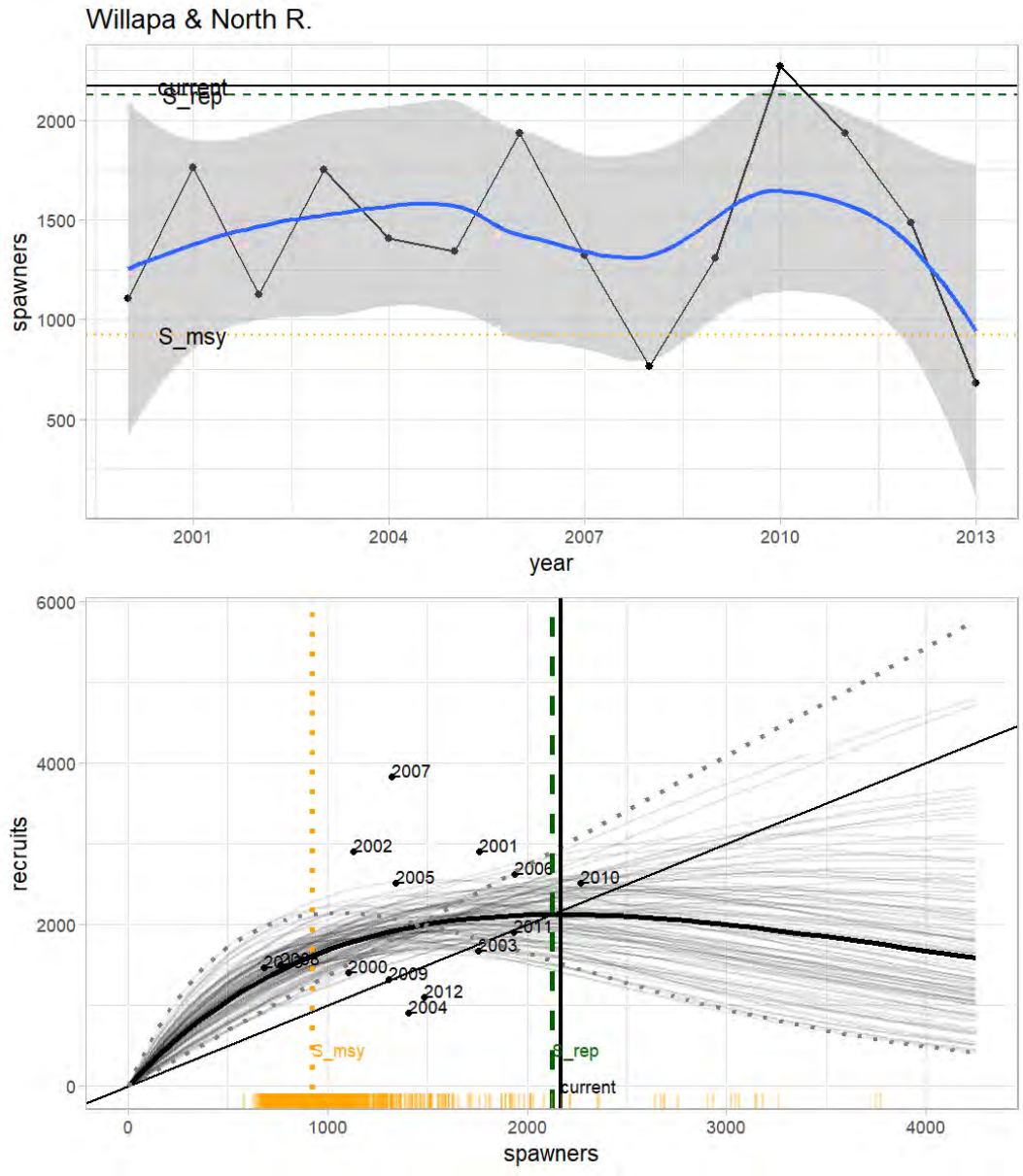


Figure 2c: Naselle and Bear River spawner time series (upper panel) and estimated Ricker spawner-recruit curves. The current natural spawner estimated capacity (solid black line) is shown relative to the fitted S_rep (dashed green line) and S_msy (dotted orange line). In the lower panel, the thick black curve shows the best-fit parameter estimates, with 100 bootstrapped fits illustrated as light grey curves and the full set of bootstrap S_msy estimates shown as short orange lines. These depict some of the uncertainty associated with reference points.

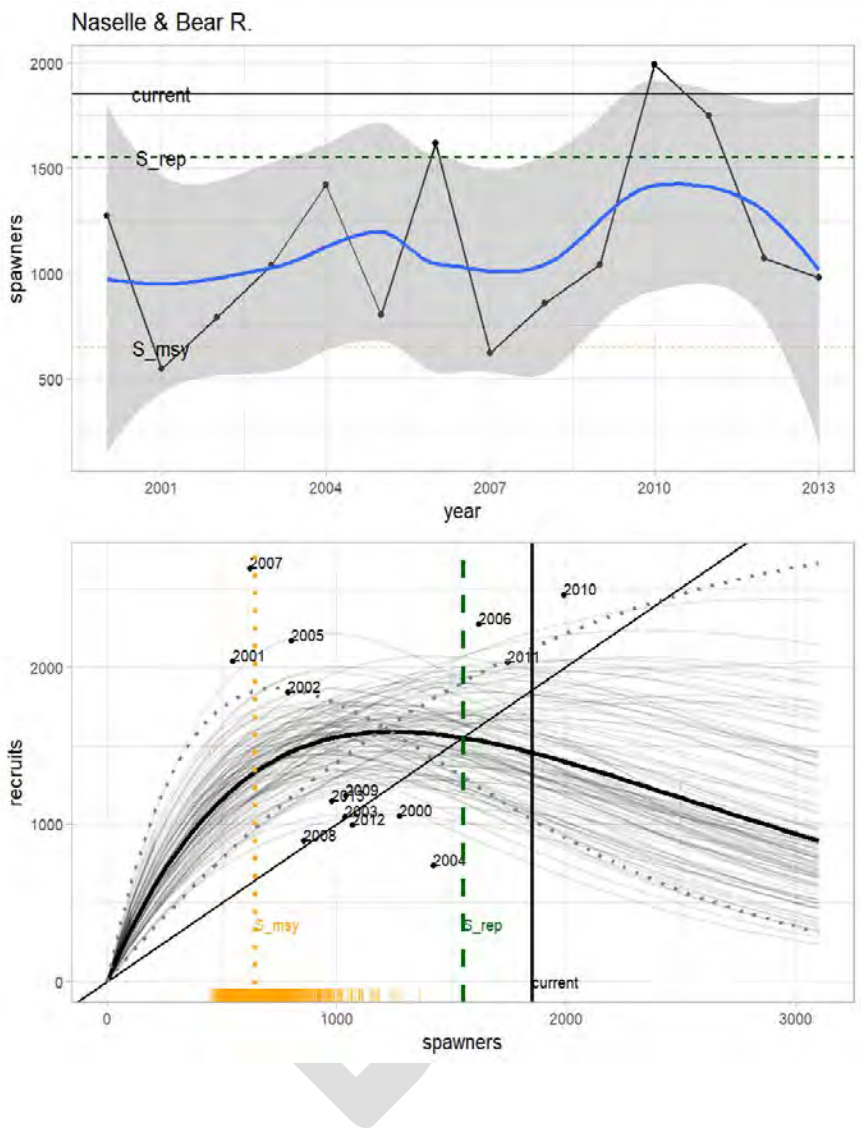


Figure 2d: Nemah and Palix River spawner time series (upper panel) and estimated Ricker spawner-recruit curves. The current natural spawner estimated capacity (solid black line) is shown relative to the fitted S_rep (dashed green line) and S_msy (dotted orange line). In the lower panel, the thick black curve shows the best-fit parameter estimates, with 100 bootstrapped fits illustrated as light grey curves and the full set of bootstrap S_msy estimates shown as short orange lines. These depict some of the uncertainty associated with reference points.

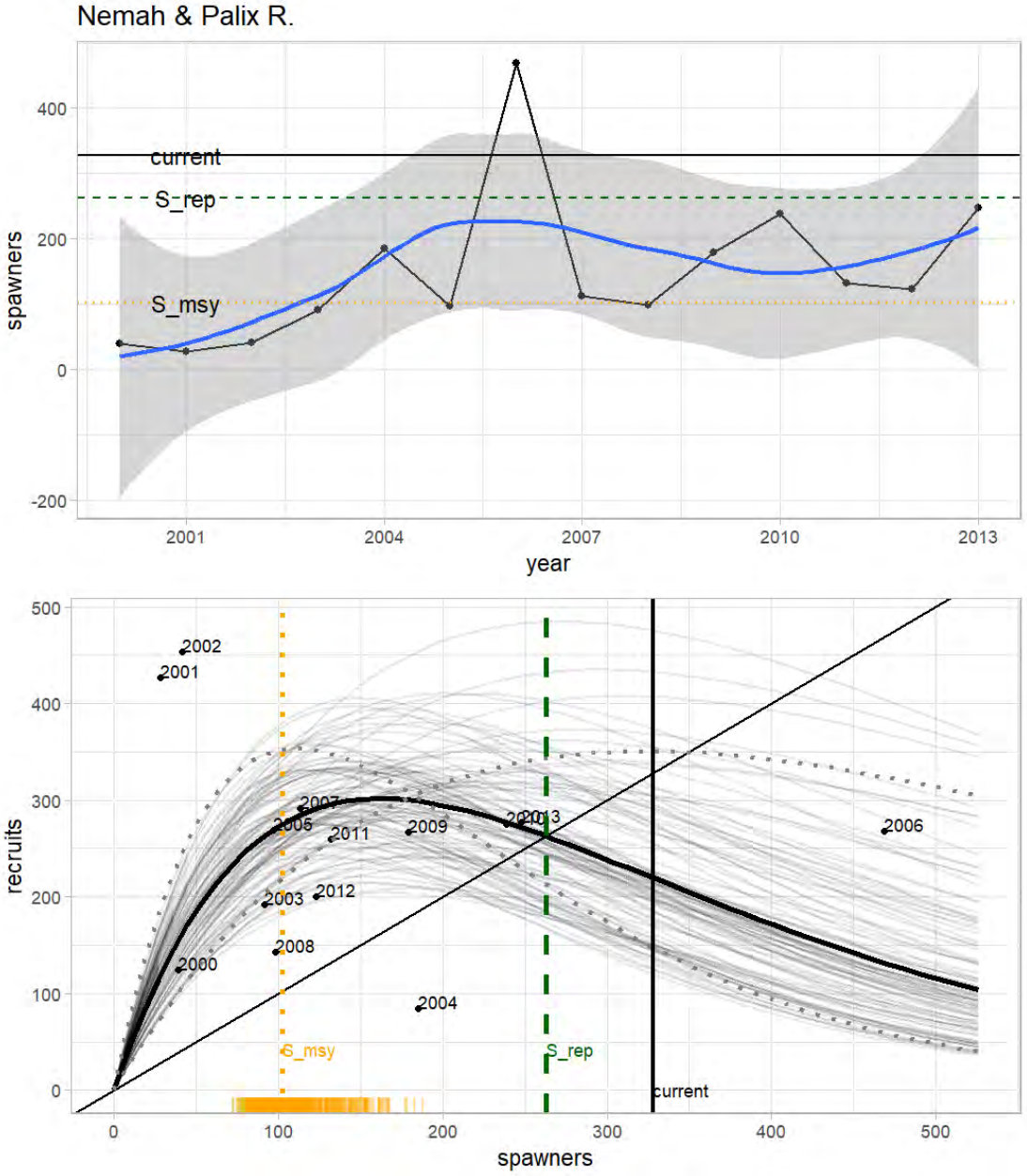


Figure 3: Number of natural origin spawners (escapement) by river, 2000-2019. Observations (solid black line) are shown with a Loess smoother trend (blue lines) and associated confidence interval (shaded colored area).

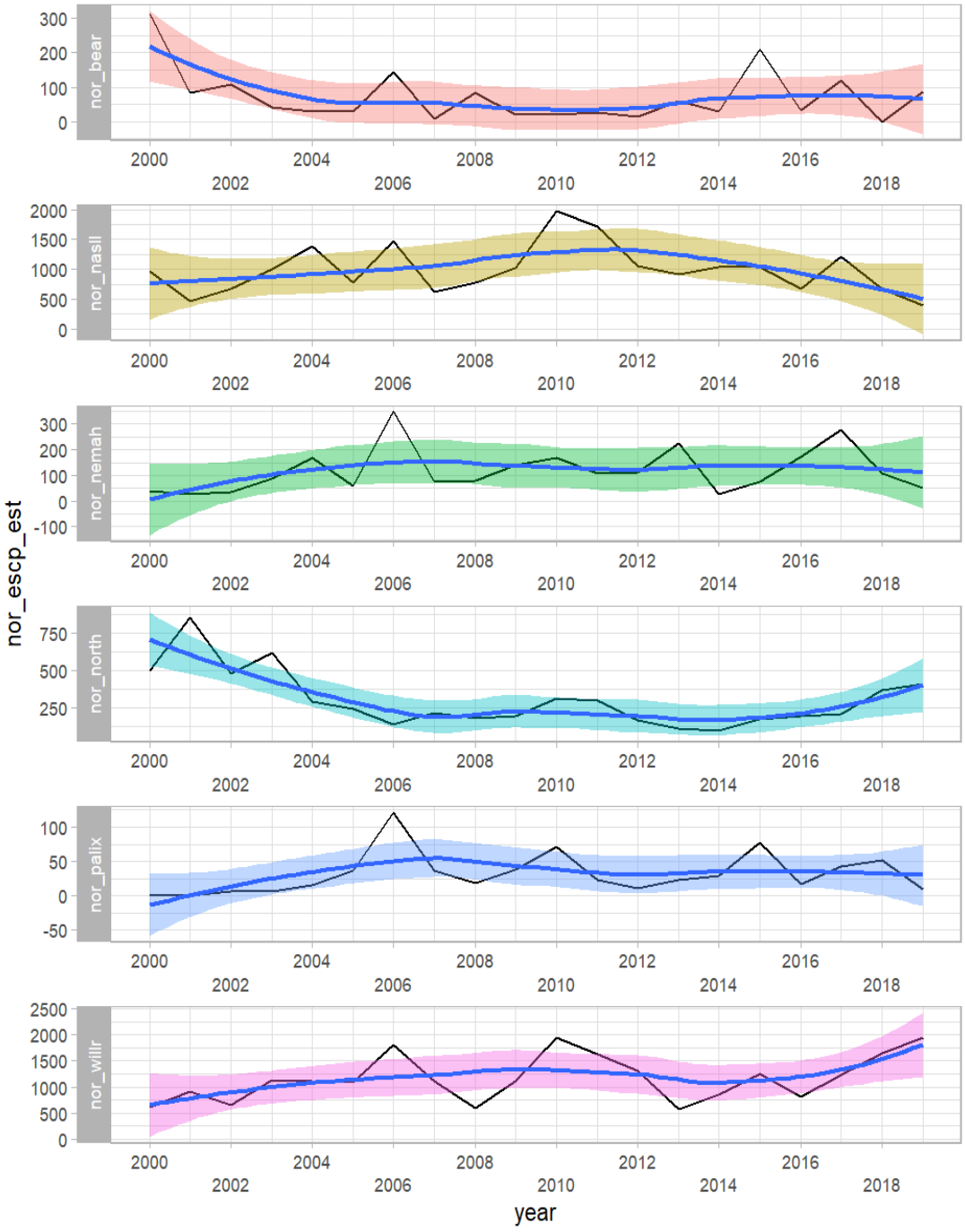


Figure 4a: Per-month low (q10), median (q50) and high (q90) percentiles of daily flow at the Willapa River USGS gage 12013500 from 1962-2019.

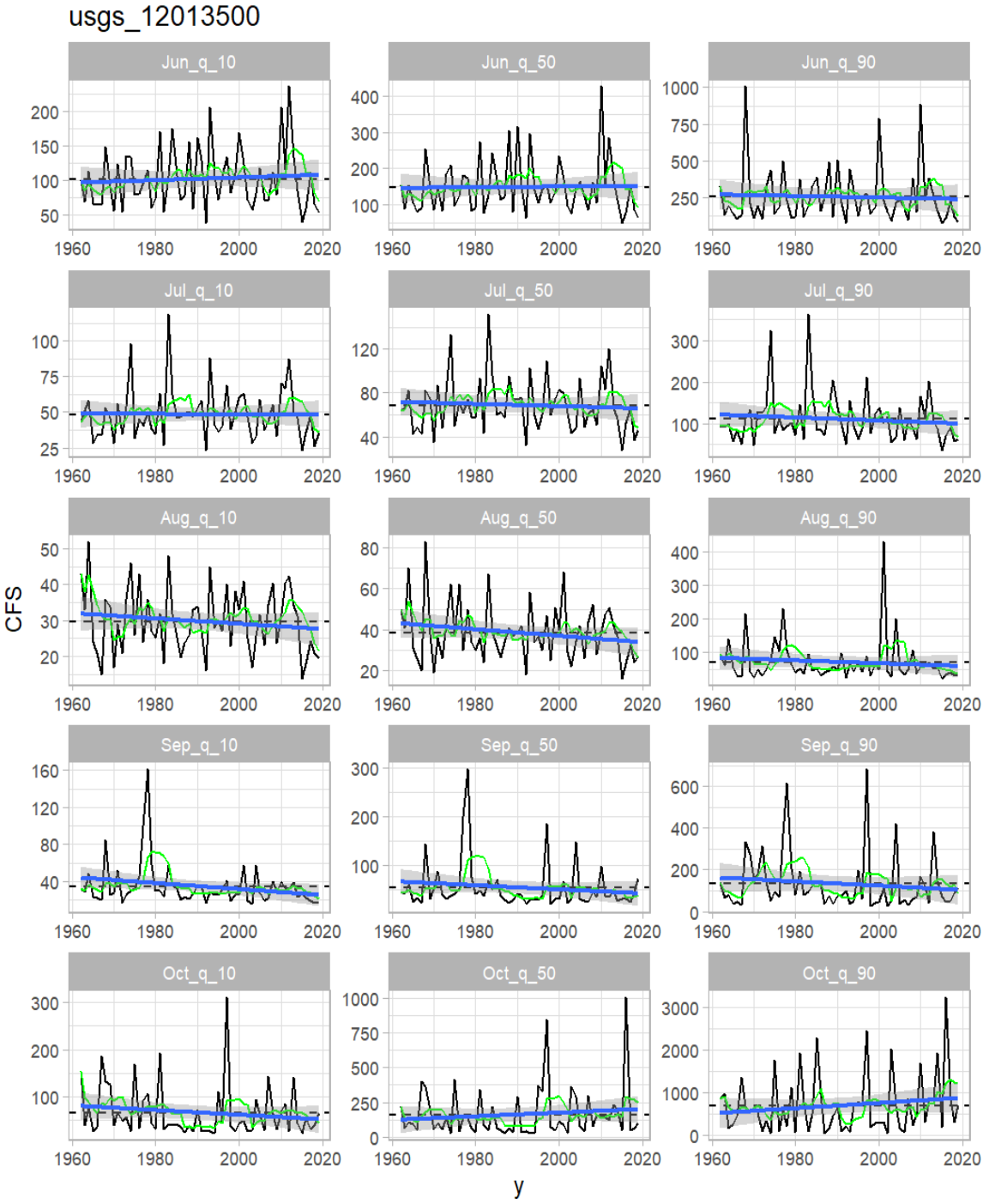
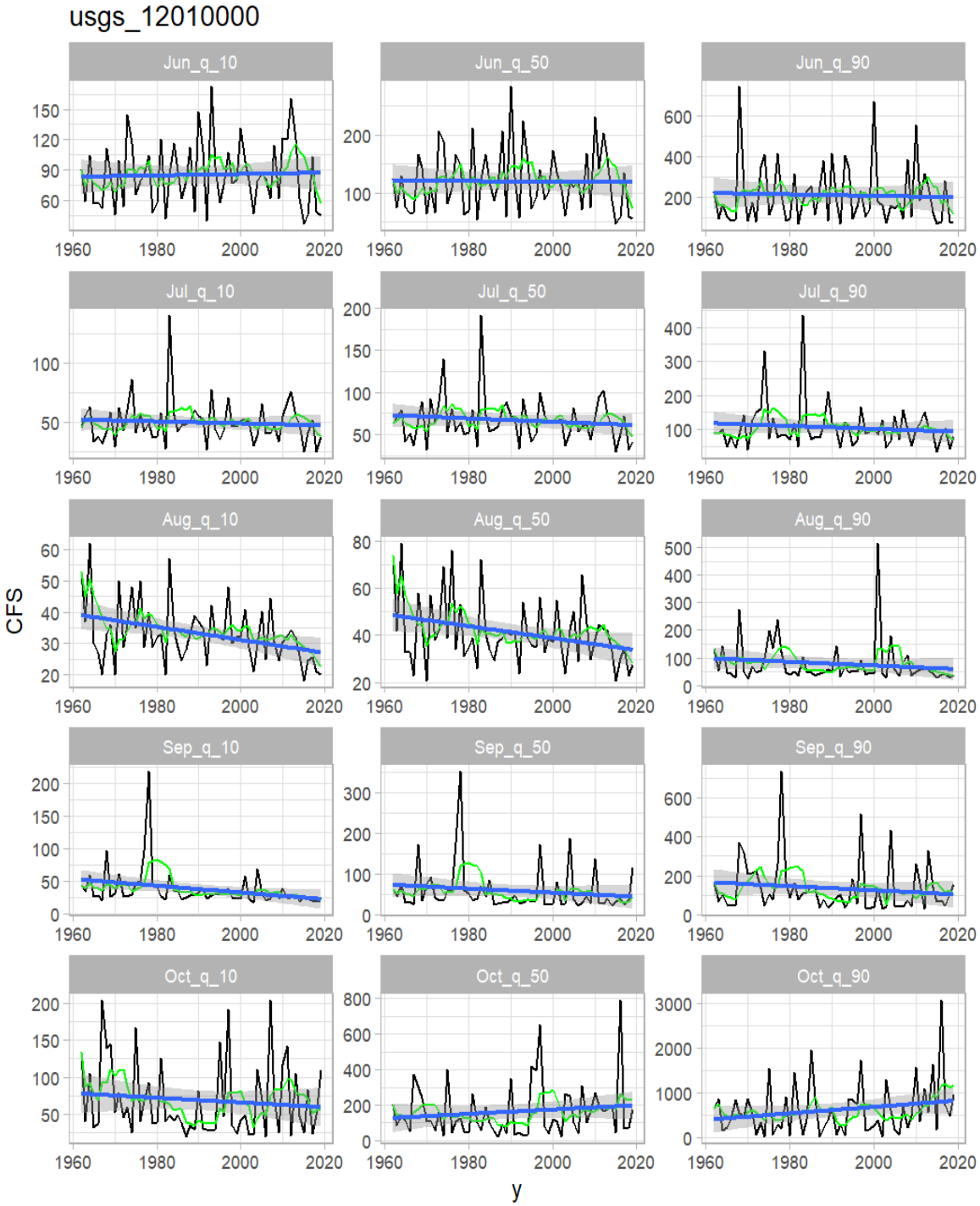
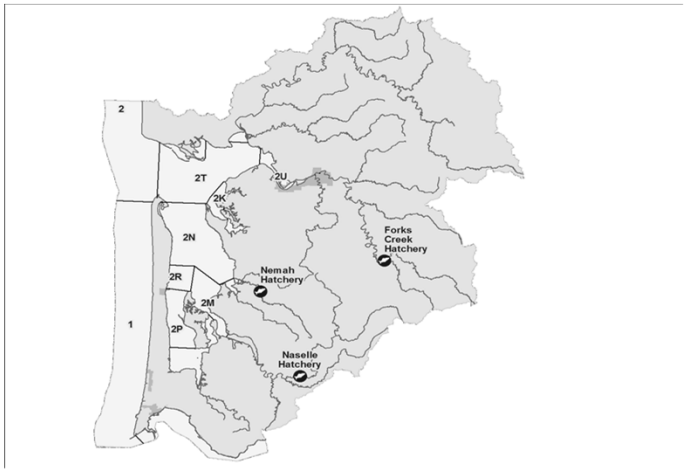


Figure 4b: Per-month low (q10), median (q50) and high (q90) percentiles of daily flow at the Naselle River USGS gage 12010000 from 1962-2019.



Appendix 2. 2015-2018 Annual Willapa Bay Fishery Management Presentations

Willapa Bay Salmon Management Policy
2015 Season Review



Chad Herring – Fish Program
Washington Fish and Wildlife Commission Meeting
February 27, 2016

1

1

Purpose

- Brief Commission on implementation of the Willapa Bay Salmon Management Policy
- Report on public feedback

WA Dept. of Fish and Wildlife, Information subject to changes and amendments over time

Commission Presentation
February 27, 2016

2

2

Presentation Outline

- Review of Key Policy Elements
- Review of 2015 Planning
- Report on 2015 Actual Performance
- Report on 2015 Recreational Monitoring
- Feedback from the Public
- 2016 Implementation

3

Key Policy Elements

- Enhance Conservation Focus
- Reduce Gear Conflict

4

Enhance Conservation Focus

- **Implement Phase I: Chinook Rebuilding**
  - 20% harvest rate limit on Naselle and Willapa River stocks
- **Pursue Alternative Commercial Gears**
  - Additional mark selective fishery opportunities
  - 1% of commercial impacts
- **Hatchery Production**
  - 350K at Forks Creek Hatchery for 2015 brood year

5

Reduce Gear Conflict

Chinook Fishery Management

- No commercial fisheries in areas 2T and 2U prior to September 16.
- No commercial fisheries in areas 2M, 2N, 2P and 2R until after Labor Day.

6

Review of 2015 Planning

- Constraining stocks
  - Chinook and Chum
- Crafted fisheries to comply with key policy elements
- Crafting alternative gear use on Naselle River Chinook was difficult

7

2015 Actual Performance

- **Recreational Fishery**
  - CRC estimates for 2015 season not available
  - Extremely productive very early in the season
  - Difficult to assess impacts
  - Need for additional monitoring
- **Commercial Fishery**
  - Chinook catch rate higher than expected
  - Could be due to forecasting, build-up issues and drought
- **Total Collapse of Coho Fishery**
  - Commercial fishery – Scheduled 27 days in Sept. & Oct. plus 20 days in Nov. but only fished 10 days in Sept.- Oct. and no time in Nov.
  - Recreational fishery limited to areas below hatcheries and mark selective

8

2015 Actual Performance

- **Chum**
  - Arrived earlier than normal
  - Couldn't find a way to access without impacting Coho in order to provide commercial opportunity
- **Chinook Pre-Spawn Mortality**
  - Drought related
  - Highest on Naselle River, also observed in Nemah and Willapa Rivers

9

2015 Actual Performance

Willapa Bay Fall Chinook - Naturals

Metric	Objective	Pre-Season	Actual*
Runsize		3,835	4,160
Spawners	4,353	3,100	2,043
Harvest Rate for Willapa/Naselle	20%/20%	20%/18.8%	15.7%/19.3%
Alternative Gear Willapa/Naselle	1%/1%	6.5%/1.1%	2.5%/0.4%

* Preliminary data subject to change

10

2015 Actual Performance

Willapa Bay Fall Chinook - Hatchery

Metric	Pre-Season	Actual*
Runsize	30,983	40,672
Escapement	18,394	28,845
Total Harvest Rate	40.6%	29.1%

* Preliminary data subject to change

WA Dept. of Fish and Wildlife, Information subject to changes and amendments over time

Commission Presentation
February 27, 2016

11

11

2015 Actual Performance

Willapa Bay Coho - Naturals

Metric	Objective	Pre-Season	Actual*
Runsize		38,505	18,112
Spawners	13,090	26,795	13,689

Willapa Bay Coho - Hatchery

Metric	Pre-Season	Actual*
Runsize	41,116	22,722
Escapement	24,262	17,813

* Preliminary data subject to change

WA Dept. of Fish and Wildlife, Information subject to changes and amendments over time

Commission Presentation
February 27, 2016

12

12

2015 Actual Performance

Willapa Bay Fall Chum

Metric	Objective	Pre-Season	Actual*
Runsize		39,994	48,756
Spawners	35,400	35,986	45,044
Harvest Rate	10%	10%	6.8%

* Preliminary data subject to change

13

2015 Actual Performance

Commercial Catch

Species	Pre-Season	Actual*
Chinook	5,143	4,858
Coho	23,314	1,929
Chum	3,243	2,833

* Preliminary data subject to change

14

2015 Actual Performance

Natural Origin Spawner Escapements

Species	Basin	Goal	Actual[2]	% of Goal
Chinook	North	991	173	17%
	Willapa	1,181	1,064	90%
	Palix	104	77	74%
	Nemah	224	35	16%
	Naselle	1,547	483[1]	31%
	Bear	306	211	69%
Coho*	--	13,090	13,689	105%
Chum	--	35,400	45,044	127%

* Escapement estimated using in-season update model
[1] Does not include 532 pre-spawn mortalities and 522 mortalities at the Naselle Hatchery
[2] Preliminary data subject to change

WA Dept. of Fish and Wildlife, Information subject to changes and amendments over time
Commission Presentation
February 27, 2016
15

15

2015 Actual Performance

Chinook Pre-Spawn Mortality - Females

	Natural	Hatchery
Naselle	532	1,865
Nemah	4	345
Willapa	18	96

* Preliminary data subject to change

WA Dept. of Fish and Wildlife, Information subject to changes and amendments over time
Commission Presentation
February 27, 2016
16

16

2015 Actual Performance

Willapa Bay Hatchery Surpluses - Hatchery

Species	Forks Creek	Nemah	Naselle	Total
Chinook	12,012	72	3,494	15,578
Coho	2,454	0	6,284	8,738
Chum	4	0	0	4

Preliminary data subject to change

17

2015 Recreational Monitoring

- **Creel Sampling – Marine Area 2.1 Tokeland**
  - From Aug. 8 – Sept. 20
  - 16 days sampled
  - 285 boats
    - 708 anglers
- **Voluntary Trip Reports**
  - From July 23 – Sept. 18
  - 275 VTR forms handed out
  - 72 VTR forms returned
    - 136 anglers

18

2015 Recreational Monitoring

		Creel	VTR
Chinook	Kept - Ad Clipped	306	87
	Kept - Unmarked	0	2
	Released - Ad Clipped	4	1
	Released - Unmarked	116	33
Coho	Kept - Ad Clipped	74	80
	Kept - Unmarked	61	43
	Released - Ad Clipped	3	0
	Released - Unmarked	2	1
Chum		0	0

19

Public Feedback

- Commercial fishery
  - Was not a viable fishery
  - Throw out the "Willapa Plan"
  - Harvest rate on unmarked Chinook should be capped at 30%
  - Did not like depending on Coho fishery for harvest especially when the Coho fishery collapsed
  - Did not like less access to Chinook
  - Should have been allowed to access Chinook that died in the rivers
  - Increase Chinook production at all Willapa Bay hatcheries

20

Public Feedback

- Recreational Fishery
  - Mostly positive for Chinook fishery except limits were too liberal
  - Emergency regulations for Coho were too restrictive
  - Department prioritized recreational fishery over conservation
  - Better monitoring of recreational fishery is necessary

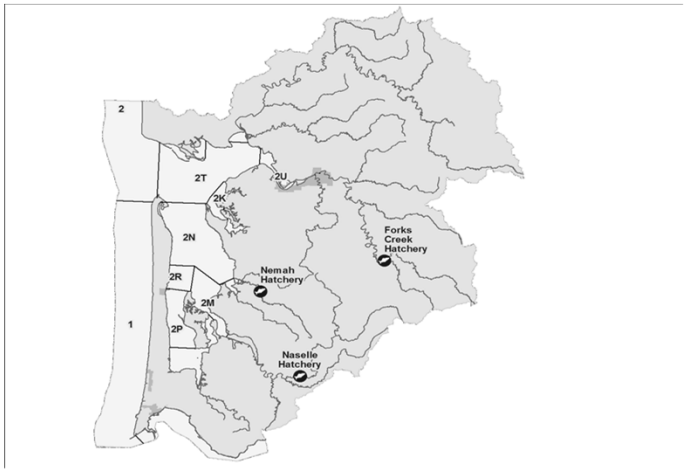
21

2016 Policy Implementation

- Constraining stocks
  - Willapa River Fall Chinook – 20%
  - Naselle River Fall Chinook – 20%
  - Willapa Bay Chum – 10%
- Implement change of the natural origin Coho escapement goal to 13,600 from 13,090
- Continue to explore alternative gear
- Review the Chum natural spawning escapement goal
- New tools for in-season updates seemed to work in 2015 for Coho and Chum
  - Will continue to refine those
- Address hatchery operations for natural origin Chinook
- Ocean Ranching Report

22

Willapa Bay Salmon Management Policy
2016 Season Review



Chad Herring – Fish Program
Washington Fish and Wildlife Commission Meeting
February 11, 2017

1

1

Presentation Outline

- Review of Key Policy Elements
  - Enhance conservation focus
  - Reduce gear conflict
- Review of 2016 Planning
- Report on 2016 Preliminary Performance
- Report on 2016 Recreational Monitoring
- 2017 Implementation

WA Dept. of Fish and Wildlife, Information subject to changes and amendments over time

Commission Presentation
February 11, 2017

2

2

Enhance Conservation Focus

- **Implement Phase I: Chinook Rebuilding**
  - 20% harvest rate limit on Naselle and Willapa River stocks
- **Pursue Alternative Commercial Gears**
  - Additional mark selective fishery opportunities
  - 6% of commercial impacts

3

Reduce Gear Conflict

Chinook Fishery Management

- No commercial fisheries in areas 2T and 2U prior to September 16.
- No commercial fisheries in areas 2M, 2N, 2P and 2R until after Labor Day.

4

Review of 2016 Planning

- Constraining stocks
  - Chinook
  - Chum
- Crafted fisheries to comply with key policy elements
- Alternative gear proposals

5

2016 Preliminary Performance

- **Recreational Fishery**
  - CRC estimates for 2016 season not available
  - Difficult to assess impacts
  - Need for additional monitoring
  - Local vs. non local
  - Landowner issues
- **Commercial Fishery**
  - Scheduled 50 openers
  - Actual 42 openers
  - Chum concern
  - Tangle net

6

2016 Preliminary Performance

- **Chinook**
  - Baseline genetic analysis
  - Challenging river flows
  - Lower than predicted natural origin return
- **Coho**
  - Hatchery runsize higher than predicted
  - Carcass recoveries
- **Chum**
  - Lots of Chum
  - In-season runsize update (ISU)

7

2016 Preliminary Performance

Willapa Bay Fall Chinook - Naturals

Metric	Objective	Pre-Season	Actual*
Runsize		**3,261**	**2,476**
Spawners	**4,353**	**2,610**	**1,581**
Harvest Rate for Willapa / Naselle	**20% / 20%**	**19.5% / 19.4%**	**25.1% / 25.0%**
Alternative Gear Willapa / Naselle	**2% / 2%**	**6.8% / 11.0%**	**2.7% / 2.7%**

* Preliminary data subject to change

8

2016 Preliminary Performance

Willapa Bay Fall Chinook - Hatchery

Metric	Pre-Season	Actual*
Runsize	36,186	22,992
Escapement	19,977	12,766
Total Harvest Rate	44.8%	44.1%

* Preliminary data subject to change

9

2016 Preliminary Performance

Willapa Bay Coho - Naturals

Metric	Objective	Pre-Season	Preliminary*
Runsize		37,069	33,233
Spawners	13,600[1]	26,012	24,946

[1] WDFW goal; PFMC goal 17,200 naturally spawning Coho

Willapa Bay Coho - Hatchery

Metric	Pre-Season	Preliminary*
Runsize	23,810	42,920
Escapement	15,535	22,672

* Preliminary data subject to change

10

2016 Preliminary Performance

Willapa Bay Fall Chum

Metric	Objective	Pre-Season	Actual*
Runsize		47,555	86,475
Spawners	35,400	42,855	80,748
Harvest Rate	10%	9.9%	6.6%

* Preliminary data subject to change

11

2016 Preliminary Performance

Commercial Landed Catch

Species	Pre-Season	Actual*
Chinook	7,512	3,144
Coho	12,512	19,304
Chum	4,425	5,183

* Does not include estimated impacts and drop off
* Preliminary data subject to change

12

2016 Preliminary Performance

Natural Origin Spawner Escapements

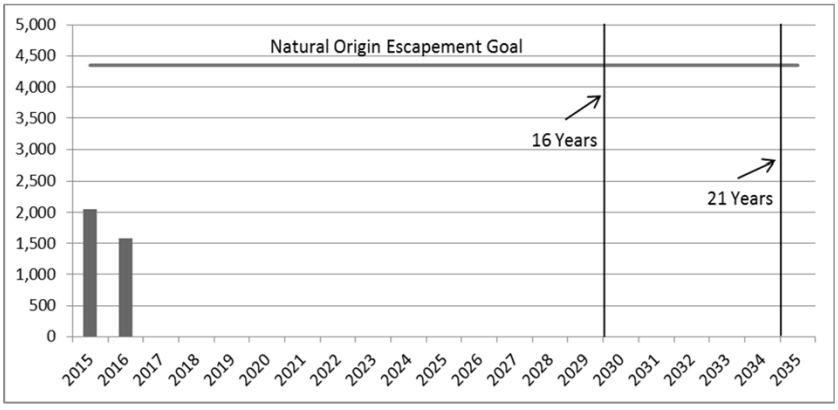
Species	Basin	Goal	Actual[2]	% of Goal
Chinook	North	991	194	20%
	Willapa	1,181	575	49%
	Palix	104	17	16%
	Nemah	224	154	69%
	Naselle	1,547	597	39%
	Bear	306	31	10%
Coho	--	13,600	24,946[1]	183%
Chum	--	35,400	80,748	228%

[1] Escapement estimated using in-season update model
[2] Preliminary data subject to change

13

2016 Preliminary Performance

Willapa Bay Chinook Natural Origin Spawner Escapement



Preliminary data subject to change

14

2016 Preliminary Performance

Chinook Pre-Spawn Mortality - Females

Basin	Natural		Hatchery	
	2015	2016	2015	2016
Naselle	532	24	1,865	5
Nemah	4	0	345	0
Willapa	18	0	96	0

Preliminary data subject to change

15

2016 Preliminary Performance

Willapa Bay Hatchery Surpluses - Hatchery

Species	Forks Creek	Nemah	Naselle	Total
Chinook	2,598	901	1,019	4,518
Coho	4,755	19	8,549	13,323
Chum	20	0	0	20

Preliminary data subject to change

16

2016 Recreational Monitoring

- **Creel Sampling**
  - **Marine Area 2.1 Tokeland & South Bend**
  - From August 1 – September 18, 2016
  - 44 days sampled
  - 1,414 interviews
    - 3,348 anglers
- **Voluntary Trip Reports (VTR's)**
  - From August 2 – September 15, 2016
  - 360 VTR forms handed out
  - 73 VTR forms returned
    - 20.3% return
    - 168 anglers

17

2016 Recreational Monitoring

Species	Status	Creel	VTR
Chinook	Kept - Ad Clipped	646	49
	Kept – Unmarked	3	5
	Released - Ad Clipped	20	5
	Released - Unmarked	232	22
Coho	Kept - Ad Clipped	151	12
	Kept - Unmarked	54	0
	Released - Ad Clipped	2	0
	Released - Unmarked	3	0
Chum	Released	1	0

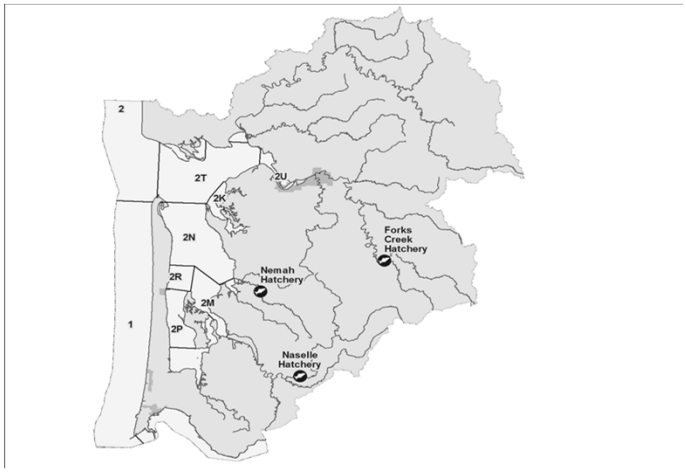
18

2017 Policy Implementation

- **Constraining stocks**
  - Willapa River Fall Chinook – 20%
  - Naselle River Fall Chinook – 20%
  - Willapa Bay Chum – 10%
- **Continue to explore alternative gear**
  - Floating pontoon fish trap
- **New tools for in-season updates seemed to work in 2016 for Coho and Chum**
  - Will continue to refine those
  - Chinook ISU
- **Wild Future Initiative**

19

Willapa Bay Salmon Management Policy
2017 Season Review



Annette Hoffmann & Chad Herring– Region 6 Fish Program
Washington Fish and Wildlife Commission Meeting
December 9, 2017

1

1

Presentation Outline

- Review of Key Policy Elements
  - Enhance conservation focus
  - Reduce gear conflict
- Review of 2017 Planning
- Fishery Review
  - Recreational
  - Commercial
- Stock Assessment
- 2018 Implementation

WA Dept. of Fish and Wildlife, Information subject to changes and amendments over time

Commission Presentation
December 9, 2017

2

2

Review of Key Policy Elements

- **Implement Phase I: Chinook Rebuilding**
  - 20% harvest rate limit on Naselle and Willapa River stocks
- **Pursue Alternative Commercial Gears**
  - Additional mark selective fishery opportunities
  - 6% of commercial impacts
- **Prioritize Species Utilization by Sector**
  - Chinook recreational priority
  - Coho and Chum commercial priority

3

Review of Key Policy Elements

Chinook Fishery Management

- No commercial fisheries in areas 2T and 2U prior to September 16.
- No commercial fisheries in areas 2M, 2N, 2P and 2R until after Labor Day.

4

Review of 2017 Planning

- Constraining stocks
  - Chinook
    - Rebuilding
    - 20% harvest rate on Naselle and Willapa stocks
  - Chum
    - 10% harvest rate
    - No commercial fisheries between October 15-31
- Alternative gear proposals
  - Floating pontoon fish trap

5

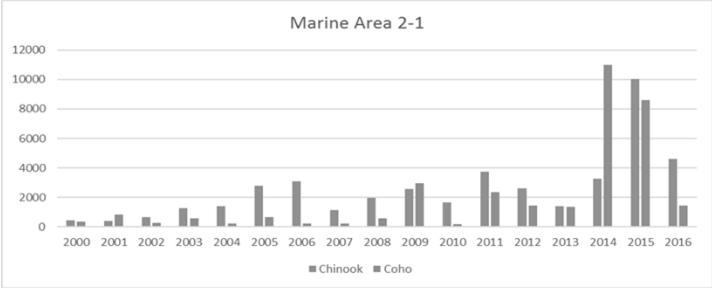
Recreational Fishery Review

- Marine Area 2-1
  - Marine Area 2 rules
  - August 1st – January 31st
  - 3 adult daily limit, release wild Chinook
  - 2-pole endorsement
- Freshwater
  - August 1st – January 31st
  - 4 adult daily limit, release wild Chinook
  - 2-pole endorsement
  - November 1st only 2 wild Coho

6

Recreational Marine Fishery Review

Years	Total Catch	
	Chinook	Coho
2011-2014 avg.	2,760	4,039
2015	10,047	8,611
2016	4,626	1,428



7

Recreational Marine Fishery Review

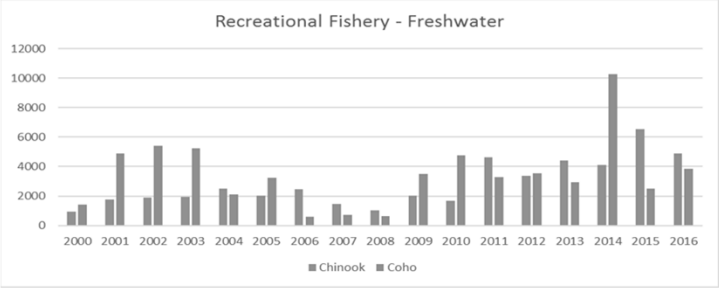
Recreational Monitoring

Year	Total Number of Interviews	Total Anglers	Chinook				Coho	
			Hatchery Retained	Natural Retained	Natural Released	Encounter Ratio	Hatchery Retained	Natural Retained
2015	351	848	385	1	151	0.3922	149	92
2016	1487	3516	695	8	254	0.3655	163	54
2017	919	2127	499	4	166	0.3327	60	37
Total	2757	6491	1579	13	571	0.3616	372	183

8

Recreational Freshwater Fishery Review

Years	Total Catch	
	Chinook	Coho
2011-2014 avg.	4,116	5,017
2015	6,544	2,494
2016	4,887	3,845



9

Recreational Fishery Review

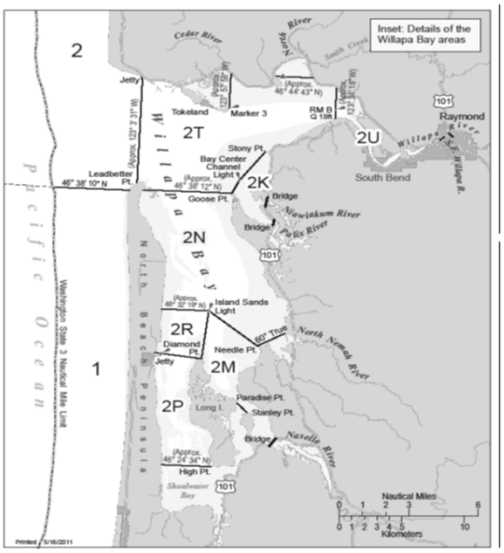
Recreational Harvest Rates – Wild Chinook

Year	Predicted Pre-Season Harvest Rates						Actual Post-Season Harvest Rates					
	Marine Area 2-1			Freshwater			Marine Area 2-1			Freshwater		
	Willapa Bay	Willapa River	Naselle River	Willapa Bay	Willapa River	Naselle River	Willapa Bay	Willapa River	Naselle River	Willapa Bay	Willapa River	Naselle River
2015	0.021	0.04	0.011	0.019	0.015	0.012	0.059	0.100	0.044	0.043	0.048	0.022
2016	0.028	0.056	0.007	0.02	0.021	0.013	0.075	0.141	0.036	0.016	0.009	0.021
2017	0.041	0.076	0.011	0.038	0.045	0.023						
Average	**0.030**	**0.057**	**0.010**	**0.026**	**0.027**	**0.016**	**0.067**	**0.120**	**0.040**	**0.029**	**0.029**	**0.021**

- **Average total actual harvest rate by sub-basin**
  - **Willapa Bay 9.6%, Willapa River 14.9%, Naselle River 6.1%**

10

Commercial Fishery Review



11

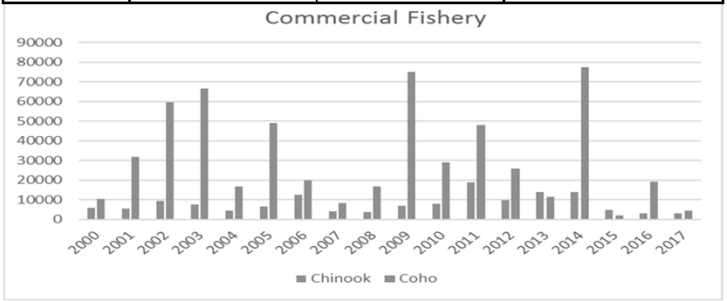
Commercial Fishery Review

- South Bay – Areas 2N, 2R, and 2M
  - September 5th – October 13th
    - 22 12-hr openers
    - 7 tangle net openers
  - November
    - 22 24-hr openers
- North Bay – Areas 2T and 2U
  - September 18th – October 13th
    - 2U – 19 12-hr openers, all tangle net
    - 2T – 10 12-hr openers, 3 tangle net
  - November
    - 22 24-hr openers

12

Commercial Fishery Review

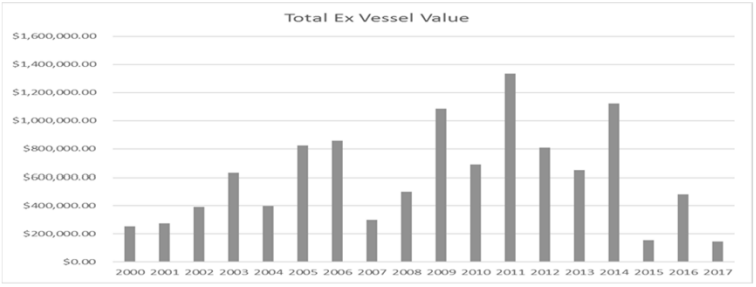
Years	Landed Catch		
	Chinook	Coho	Ex-Vessel Value*
2011-2014 avg.	13,990	40,698	$978,437
2015	4,737	1,922	$155,579
2016	3,144	19,304	$480,513
2017	2,946	4,575	$146,964

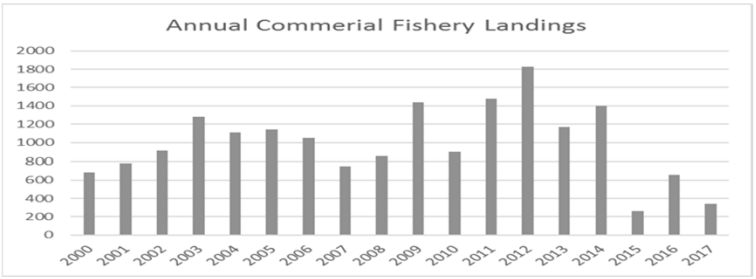


* GDP adjusted to 3rd Quarter 2017

13

Commercial Fishery Review





14

Commercial Fishery Review

Commercial Fishery Monitoring – Wild Chinook

Total Impacts						
Year	Predicted			Actual		
	Willapa Bay	Willapa River	Naselle River	Willapa Bay	Willapa River	Naselle River
2015	581	208	303	515	122	314
2016	493	169	281	298	97	173
2017	468	155	242	290	169	105

Harvest Rate						
Year	Predicted			Actual		
	Willapa Bay	Willapa River	Naselle River	Willapa Bay	Willapa River	Naselle River
2015	15.2	14.5	16.5	11.9	7.6	15.6
2016	15.1	11.8	17.3	12.3	9.2	18.8
2017	11.3	7.8	14.4			

15

Commercial Fishery Review

Alternative Gear

Year	Policy Objective		Pre-Season		Actual	
	Willapa River	Naselle River	Willapa River	Naselle River	Willapa River	Naselle River
2015	1.0%	1.0%	6.5%	1.1%	2.5%	0.4%
2016	2.0%	2.0%	6.8%	11.0%	2.7%	2.7%
2017	6.0%	6.0%	6.0%	11.9%		

- Tangle net use
- Terminal areas
- Condition upon release

16

Commercial Fishery Review

- Alternative Gear Proposals
  - Floating pontoon fish trap
    - Emerging Commercial Fishery
      - CR-101 filed April 19,2017
    - 3 stakeholder meetings
    - Public comment
      - Unlimited entry, time and place, ability to participate given timeframe, and faulty process
    - Withdrawn on June 14, 2017
    - Experimental Commercial Fishery
      - CR-101 filed June 14, 2017
    - 3 stakeholder meetings
    - Public comment similar to previous meetings

17

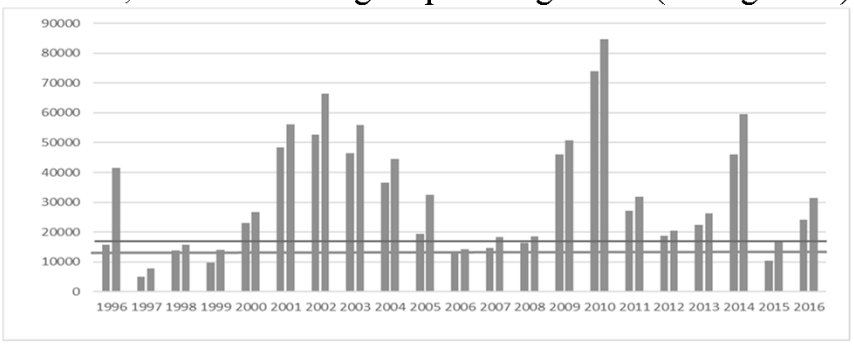
Stock Assessment - Chinook

Basin	North River/Smith Creek		Willapa River		Naselle River		Willapa Bay Basin	
Pop. Des.	Primary		Primary		Contributing		BASIN TOTAL	
Goal	991		1181		1547		4353	
Year	NOS	pHOS	NOS	pHOS	NOS	pHOS	NOS	pHOS
2010	315	0%	1873	69%	1971	82%	4418	76%
2011	298	0%	1473	70%	1415	87%	3331	81%
2012	168	0%	1191	66%	581	92%	2057	81%
2013	113	0%	481	77%	767	82%	1669	80%
2014	99	47%	784	74%	975	81%	1936	81%
2015	173	0%	1064	70%	483	68%	2043	73%
2016	194	0%	575	81%	597	75%	1581	74%
2017	**190**	**0%**	**1668**	**66%**	**1191**	**24%**	**3392**	**61%**
2010-2016 Avg.	***194***	***7%***	***1063***	***72%***	***970***	***81%***	***2434***	***78%***

18

Stock assessment - Coho

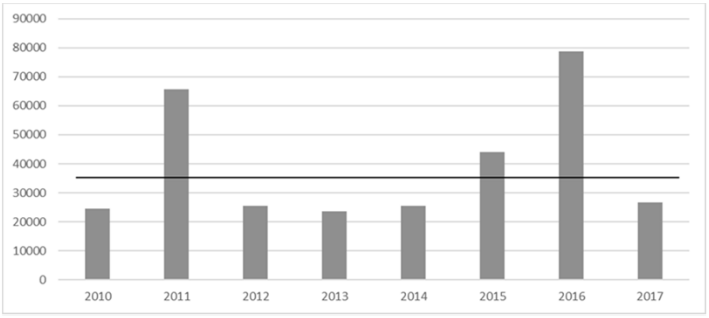
- PFMC Objective
  - 17,200 naturally spawning Coho (Blue line)
- WDFW Objective
  - 13,400 natural origin spawning Coho (Orange line)



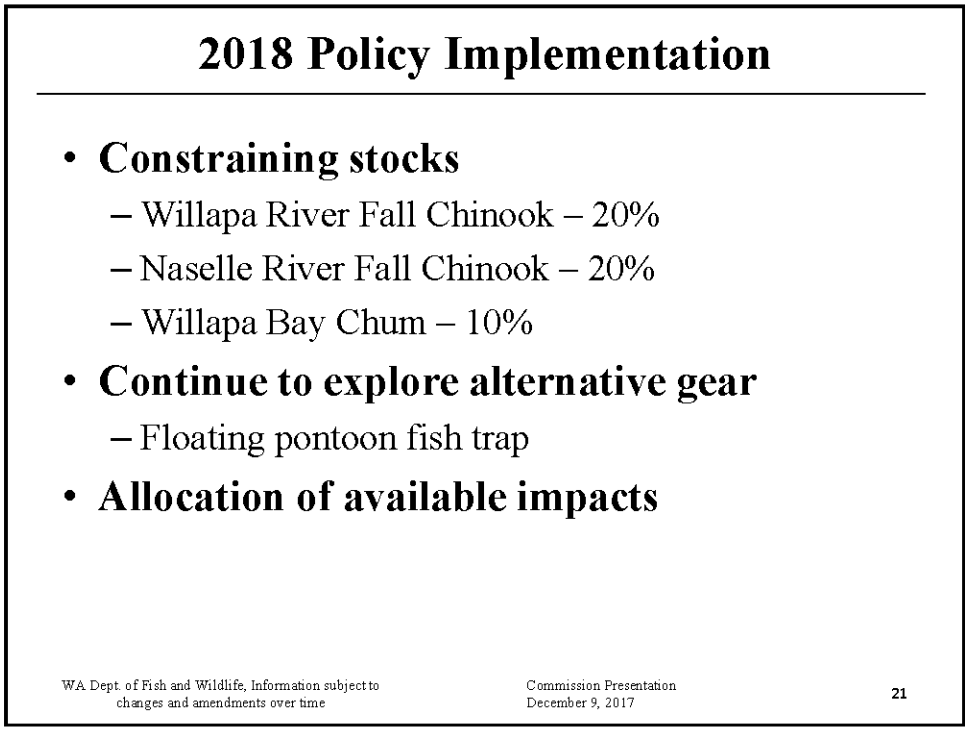
19

Stock assessment - Chum

- Spawner Escapement Objective
  - 35,400

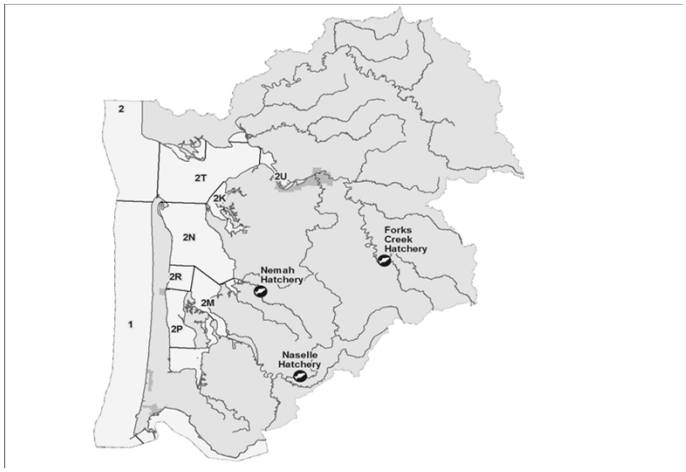


20


2018 Policy Implementation
• Constraining stocks
– Willapa River Fall Chinook – 20%
– Naselle River Fall Chinook – 20%
– Willapa Bay Chum – 10%
• Continue to explore alternative gear
– Floating pontoon fish trap
• Allocation of available impacts
WA Dept. of Fish and Wildlife, Information subject to changes and amendments over time
Commission Presentation
December 9, 2017
21

21

Willapa Bay Salmon Management Policy



Annette Hoffmann & Chad Herring– Region 6 Fish Program
Washington Fish and Wildlife Commission Meeting
February 10, 2018

1

1

Presentation Outline

- Clarify Annual Review
- Policy base assumptions and performance
- Clarification of policy intent
- Proposed public process

WA Dept. of Fish and Wildlife, Information subject to changes and amendments over time

Commission Presentation
February 10, 2018

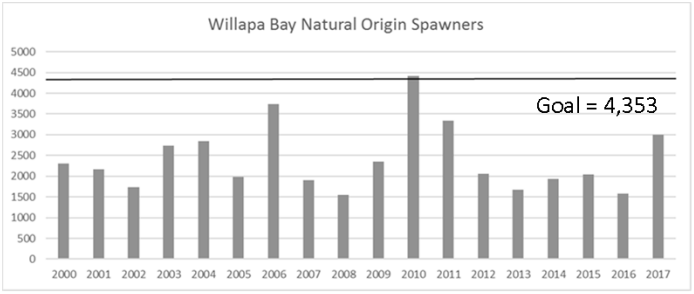
2

2

Supplement to Annual Review

CHINOOK

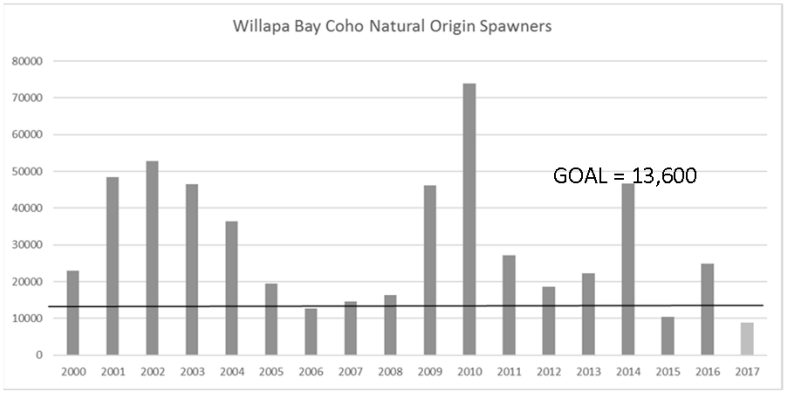
	GOAL	2015	2016
Willapa River	20%	22.4%	24.1%
Naselle River	20%	22.1%	24.6%



3

Supplement to Annual Review

COHO



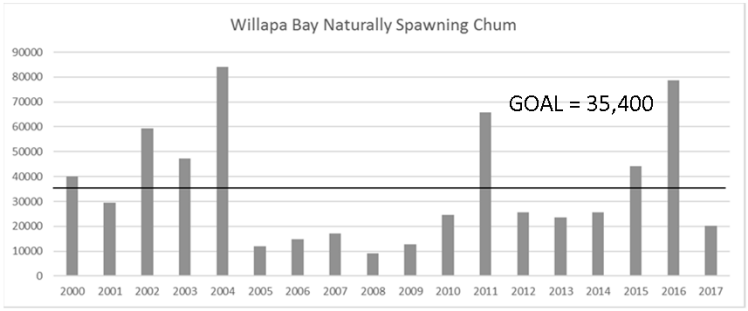
2017 is preliminary

4

Supplement to Annual Review

CHUM

	GOAL	2015	2016
Willapa Bay	10%	6.8%	6.7%



5

Policy Base Assumptions

- Proper hatchery operations
- Develop alternative selective gear
- Conduct adequate monitoring
- Adequate communication
- Chinook allocation
- Economic well being of fisheries

6

Policy Base Assumptions

–Proper hatchery operations for Chinook by 2020

Year	North/Smith Primary	Willapa R Primary		Naselle R Contributing	
	pHOS	pHOS	PNI	pHOS	PNI
	< 30%	< 30%	> 67%	< 30%	> 50%
2015	No Data	70%	51%	69%	18%
2016	No Data	81%	52%	75%	14%
2017*	No Data	75%	30%	26%	35%

* preliminary

WA Dept. of Fish and Wildlife, Information subject to changes and amendments over time

Commission Presentation
February 10, 2018

7

7

Policy Base Assumptions

–Proper hatchery operations for Coho by 2015

	North/Smith Primary	Willapa R Primary		Nemah Contributing
Goals	pHOS < 30%	pHOS < 30%	PNI > 67%	pHOS < 30%
2015	14%	46%	52%	No Data
2016	0%	27%	78%	No Data
2017*	0%	68%	30%	No Data

* preliminary

WA Dept. of Fish and Wildlife, Information subject to changes and amendments over time

Commission Presentation
February 10, 2018

8

8

Policy Base Assumptions

- Proper hatchery operations for Chinook by 2020
  - Weir efficiency
  - Program adjustments

Hatchery	Release 2015	Release 2016	See Transition
Forks	3.2M	350K	2019-20
Naselle	800K	2.5M	2019-20

9

Policy Base Assumptions

- Develop alternative selective gear
  - Recreational - Mark selective regulations
  - Commercial
    - Tangle Net

Year	Alt Gear Goal	Willapa R	Naselle R
2015	1%	2.5%	0.4%
2016	2%	2.6%	2.7%
2017	6%	8.4%	4.7%

* preliminary

    - Fish Trap – suspended in 2017

10

Policy Base Assumptions

- Conduct adequate monitoring (commercial)
  - 20% sample rate
  - 15% observer rate
  - Allows for in-season fishery adjustments based on actual harvest
  - Provides CPUE data for in-season updates on coho
  - Allows for future model improvements

11

Policy Base Assumptions

- Conduct adequate monitoring (recreational)
  - Have not had adequate information for in season fishery adjustments based on actual harvest
    - Policy assumed 3.2% impact rate on NORs.
    - The average impact rate on Willapa River NOR's is 14.9%
  - Allows for future model improvements

12

Policy Base Assumptions

– Conduct adequate monitoring (spawner surveys)

- Provides for in-season updates on runsizes for coho and chum for fishery management
- Provides for post season spawner escapement
- Provides for spawner age and origin composition (pHOS)

13

Policy Base Assumptions

– Adequate Communication

– Pre season
  - Multiple stakeholder meetings for North of Falcon (forecast, management objectives, modeling of fisheries and fishing package development)
  - Rule Making public hearing

– In-season
  - Weekly summaries (Aug-Sep) are provided stakeholders on commercial harvest, hatchery escapement, recreational monitoring information.
  - Communication on in-season management actions

– Post season
  - Annual review with Fish and Wildlife Commission

14

Policy Base Assumptions

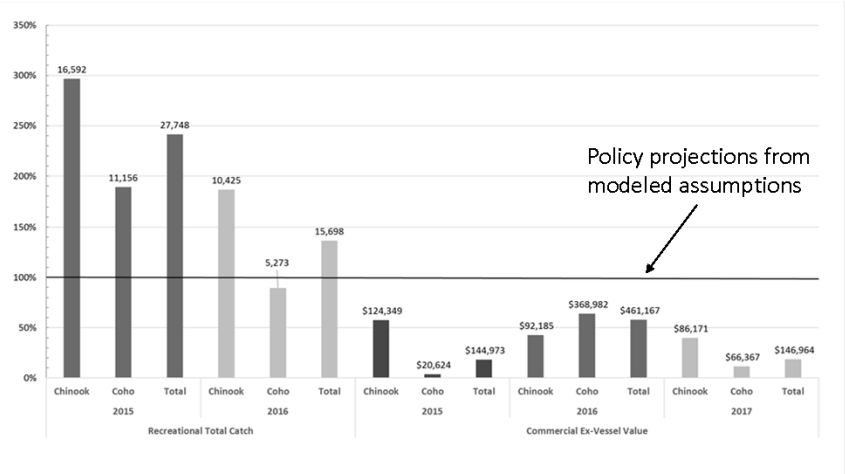
- Chinook Allocation in Priority Order

  - Chinook impacts allocated to recreational fisheries
  - Alternative gear policy set asides
  - Commercial gillnet gear

15

Policy Base Assumptions

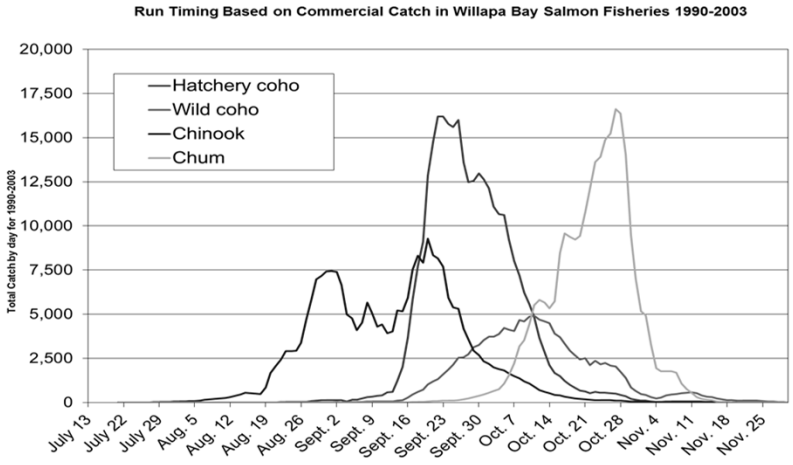
- Economic well-being of fisheries



16

Clarification of Policy Intent

- Mixed stock fishery



17

Clarification of Policy Intent

- Does the application of the policy language represent the Commission's intent?

18

Public Comments

- From Raymond Public Workshop Jan 23
  - Examples of Comments on Priority
    - No priorities
    - Don't change priorities if you can't hit the goal
    - There is no conflict for priorities.
    - Priority is opportunity for all within conservation limits

wdfw.wa.gov/fishing/commercial/salmon/season_setting

19

Proposed Process

- Public engagement
- Identify issues
  - Expand on base assumptions
  - Key conflicts
  - Policy review
- Brief the Fish and Wildlife Commission on developments this fall

20

Appendix 3. Status Determination Criteria for Willapa Bay Natural Coho

Status Determination Criteria for Willapa Bay Natural Coho

Salmon Technical Team
and
Washington Department of Fish and Wildlife

October 2, 2014

Prepared by:
Robert Kope
Northwest Fishery Science Center
National Marine Fisheries Service
2725 Montlake Blvd E
Seattle, WA 98077

Introduction

When the Council took final action on Amendment 16 to the Salmon FMP at the June, 2011 meeting in Spokane, among other things, Willapa Bay natural coho were added to the FMP. Because this stock is not currently included in the Pacific Salmon Treaty, they are subject to the annual catch limit (ACL) requirement. In addition, regardless of whether or not they are subject to the ACL requirement, they require specification of S_{MSY}, and status determination criteria (SDC). We currently report on the escapement of this stock in our annual review of Ocean Salmon Fisheries, and list a WDFW escapement goal of 13,090, but there is no FMP goal. The WDFW goal is based on watershed area, so it could be argued that it is an estimate of S_{MSY}, but that has not been done; the goal has not been reviewed or adopted by the Council, and there is no estimate of F_{MSY}. We also have no F_{MSY} proxy for tier 2 coho stocks (stocks with no direct estimate of F_{MSY}), so we have no basis for developing SDC or an ACL control rule. Consequently, the status quo is that S_{MSY}, SDC (MSST, OFL, FMFT), as well as ACL are all undefined.

The purpose of this report is to develop SDC for Willapa Bay natural coho from evaluation of spawner-recruit data.

Background

Willapa Bay coho were historically managed for hatchery production. Hatcheries are located on Forks Creek (Willapa River), Nemah River, and Naselle River, but the hatchery program on the Nemah River was discontinued in 2009. In the mid-1990s WDFW began monitoring natural spawning escapement and established natural escapement goals based on available habitat, assuming that habitat in the Willapa Bay drainage was near the lower end of the range for smolt productivity observed in WDFW smolt trapping in other watersheds (Table 1).

In addition to ocean recreational and commercial fisheries, within Willapa Bay, there are commercial net fisheries, and recreational fisheries both in the bay itself, and freshwater fisheries in the tributaries.

Data and Methods

WDFW monitors spawning escapement and fisheries in Willapa Bay. The STT reports terminal catch data and spawning escapement in Appendix Table B-24 of our annual Review of Ocean Salmon Fisheries (STT 2013). Data in this table include natural spawners, hatchery spawners, terminal run, and terminal catches in gillnet and sport fisheries. However, WDFW maintains a more detailed dataset used for run reconstruction. The run reconstruction allocates catches to individual rivers and to hatchery and natural production on the basis of timing, location, and mark status. The run reconstruction backs natural and hatchery origin spawners out to terminal run size (Table 2). Spawner data used in this analysis were total natural are spawners regardless of origin, with no discounting for the effectiveness hatchery origin spawners in natural areas.

Recruits were calculated by expanding the terminal run of natural origin adults by the pre-terminal ocean exploitation rates for unmarked fish calculated using the fishery regulation assessment model (FRAM).

While CWT data are available for hatchery fish from Forks Creek, Naselle, and Nemah Hatcheries in Willapa Bay, natural production is unmarked. During the time period for which data are available, mark-selective ocean fisheries have been implemented. Because there have been mixtures of mark-selective and non-selective fisheries within fisheries in individual years, there is no easy way to infer exploitation rates on unmarked fish from CWT data. In order to infer incidental mortality on unmarked fish from CWT data, it would be necessary to examine the time and location of each tag recovery and determine whether or not the fishery in which it was recovered was mark-selective in that port on that date. Thus pre-terminal exploitation rates for unmarked fish from FRAM provide a more consistent and convenient framework for generating pre-harvest recruit estimates, and were used for this analysis (Table 3). This is consistent with the methods used for other Washington coast coho stocks.

A stochastic Ricker spawner-recruit relationship (SRR) was fitted to the data. The SRR was of the form:

(1) $$R_{t+3} = \alpha S_t e^{-\beta S_t + \varepsilon_t}$$

where R is natural origin pre-harvest recruits, S is natural area spawners, and ε assumed to be normally distributed independent errors with mean 0 and variance σ^2. The SRR was fitted by least squares regression after transforming it:

(2) $$\ln\left({R_{t+3}}/{S_t}\right) = \ln(\alpha) - \beta S_t + \varepsilon_t$$

Parameter estimates were corrected for process error, with estimation bias and measures of precision of parameter and reference point estimates derived by bootstrapping 100,000 samples using the methods described in STT (2005).

Results and Discussion

The bias corrected parameter estimates along with MSY reference points are presented in Table 4, along with bootstrapped estimates of bias and precision. The fit of the Ricker spawner-recruit relationship is shown in Figure 1. The estimated S_{MSY} of 17,200 natural area spawners is somewhat higher than the current WDFW escapement goal of 13,090 spawners for the aggregate of all subcomponents of the Willapa Bay coho stock based on habitat area (Table 1). However, the agency goal is for natural origin spawners, while the analysis presented here used all spawners in natural areas regardless of origin. Since 1996, natural origin spawners have accounted for approximately 79% of the total spawning escapement to natural areas. Applying

this average percentage of natural origin spawners, the S_{MSY} value of 17,200 equates to 13,600 natural origin spawners. This is surprisingly similar to the current escapement goal.

The estimated F_{MSY} of 0.74 from this analysis is somewhat higher than values estimated for other Washington coastal coho stocks. Those ranged from 0.59 for the Quillayute River, to 0.69 for the Hoh River and Grays Harbor.

Recommendations

The STT currently reports spawning escapement for Willapa Bay coho in terms of natural origin and hatchery origin fish. Current agency goals are also expressed in these terms. From a pragmatic standpoint, it makes more sense to have an escapement goal (and SDC) based on the number of fish actually spawning, rather than on a portion of the natural spawning escapement. This is consistent with escapement goals on for other Washington coho stocks, and with the SDC the Council has adopted for Klamath River fall Chinook. The analysis presented here supports reference points of $F_{MSY} = 0.74$, and $S_{MSY} = 17,200$.

Based on these reference points the recommended SDC are:

$MFMT = F_{MSY} = 0.74$,

and

$MSST = 0.5*S_{MSY} = 8,600$.

While other Washington coastal coho and Puget Sound coho stocks are exempt from the ACL requirement by virtue of being managed under an international agreement, Willapa Bay coho are not. Under the FMP, as a tier 1 stock, Willapa Bay coho would thus have an ACL set by the $F_{ABC} = 0.95*F_{MSY} = 0.71$.

References

STT. 2013. Review of 2012 Ocean Salmon Fisheries. Pacific Fishery Management Council. Portland, OR. February 2013. 364p.

STT 2005. Klamath River fall Chinook stock-recruitment analysis. Agenda Item G.1.b, Pacific Fishery Management Council. September, 2005. 31p.

Table 1. Current WDFW coho natural spawning escapement goals for Willapa Bay based on habitat area.

Watershed	Escapement Goal	Hatchery Program
North River/Smith Creek	5,286	No
Willapa River	4,030	Yes
Palix River	251	No
Nemah River	994	Yes[1]
Naselle River	2,091	Yes
Bear River	438	No
Total	13,090	

[1] The hatchery program was discontinued in 2009.

Table 2. Summary of the terminal run reconstruction. Spawning escapement is separated into natural spawning and hatchery spawning, and fish are identified as either natural origin (NOR), or hatchery origin (HOR). Numbers that fed into the spawner-recruit analysis are indicated in bold.

	Spawners					Terminal Catch				Terminal Run Size	
	Natural			Hatchery		Recreational		Commercial			
Year	NOR	HOR	total	HOR	NOR	NOR	HOR	NOR	HOR	NOR	HOR
1996	15,711	25,824	**41,535**	23,071	-	796	3,256	7,953	30,369	24,460	82,520
1997	4,934	2,879	**7,813**	3,520	-	360	446	504	1,022	5,799	7,866
1998	13,804	1,971	**15,775**	4,814	-	297	555	5,687	7,453	19,788	14,793
1999	9,628	4,404	**14,032**	18,307	-	331	2,505	3,866	1,601	**13,825**	26,817
2000	23,031	3,648	**26,679**	25,500	3	177	1,603	3,702	6,624	**26,913**	37,375
2001	48,404	7,752	**56,156**	46,607	-	2,082	3,607	6,350	25,562	**56,836**	83,528
2002	52,722	13,702	**66,424**	41,136	-	1,500	4,185	15,395	44,037	**69,616**	103,061
2003	46,469	9,474	**55,943**	59,323	235	1,639	4,087	16,926	49,541	**65,269**	122,425
2004	36,437	7,996	**44,433**	13,224	202	968	1,393	9,190	7,336	**46,797**	29,949
2005	21,904	10,654	**32,558**	34,511	103	977	2,915	42,509	6,492	**65,493**	54,572
2006	12,009	2,292	**14,301**	5,796	297	342	464	9,934	10,014	**22,583**	18,565
2007	18,022	2,502	**20,524**	6,741	180	412	543	5,167	3,051	**23,781**	12,837
2008	14,778	3,784	**18,561**	8,704	120	540	687	11,067	5,632	**26,505**	18,806
2009	45,354	5,296	**50,650**	17,517	301	2,999	3,462	38,792	36,625	**87,447**	62,899
2010	76,434	16,594	93,028	23,581	139	1,311	3,618	16,698	21,414	**94,582**	65,207
2011	30,523	5,415	35,938	17,360	216	2,092	3,726	18,488	29,685	**51,320**	56,185
2012	20,024	937	20,961	12,846	232	2,735	2,317	13,913	11,978	**36,904**	28,078

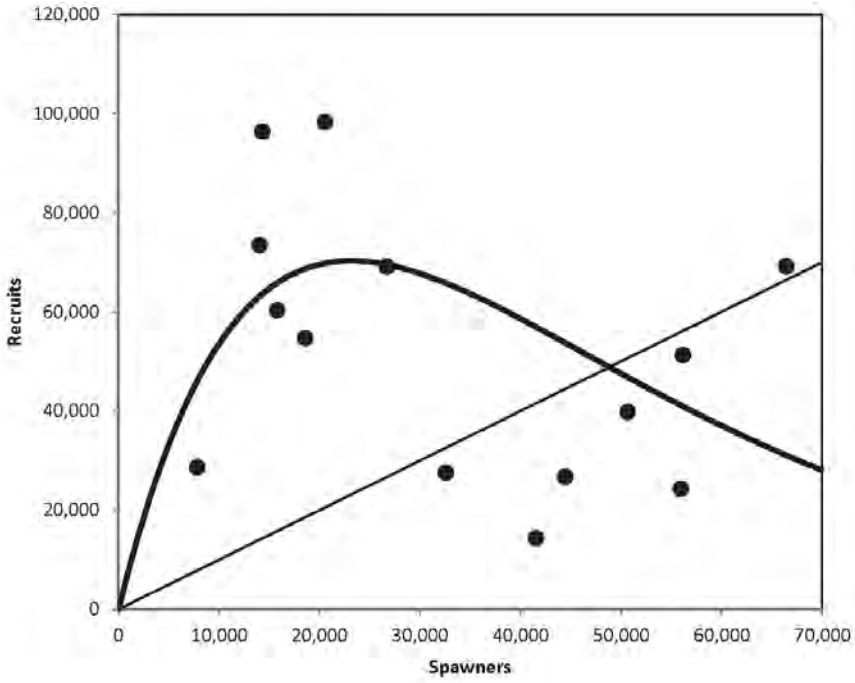
Table 3. Spawning escapement and recruitment data used for Willapa Bay coho. Spawners include both natural origin fish and hatchery origin fish that spawned in natural areas. Recruits include only natural origin fish. Data used in spawner-recruit analysis are in **bold**.

Return Year	Total ER	Ocean ER	Natural Esc (inc hatchery strays)	NOR Esc	NOR Terminal Run	NOR Adult Recruits (NOR TR/(1-OcnER))
1996	42%	14%	**41,535**	15,711	24,549	28,489
1997	22%	10%	**7,813**	4,934	5,823	6,432
1998	43%	5%	**15,775**	13,804	19,824	20,726
1999	21%	4%	**14,032**	9,628	14,061	**14,398**
2000	24%	6%	**26,679**	23,034	26,992	**28,672**
2001	30%	6%	**56,156**	48,404	56,959	**60,285**
2002	39%	5%	**66,424**	52,722	69,672	**73,441**
2003	40%	6%	**55,943**	46,704	65,408	**69,013**
2004	32%	9%	**44,433**	36,639	46,819	**51,132**
2005	45%	5%	**32,558**	22,007	65,594	**69,137**
2006	52%	7%	**14,301**	12,306	22,609	**24,343**
2007	34%	11%	**20,524**	18,202	23,805	**26,628**
2008	33%	4%	**18,561**	14,898	26,546	**27,608**
2009	59%	9%	**50,650**	45,655	87,732	**96,305**
2010	27%	4%	93,028	76,573	94,582	**98,269**
2011	45%	5%	35,983	30,739	51,320	**54,166**
2012	50%	7%	20,961	20,256	36,904	**39,836**

Table 4. Parameter estimates and reference points for Willapa Bay coho from fitting a Ricker spawner-recruit relationship to Willapa Bay coho data with correction for process error. Estimates of bias and precision based on 100,000 bootstrap replicates.

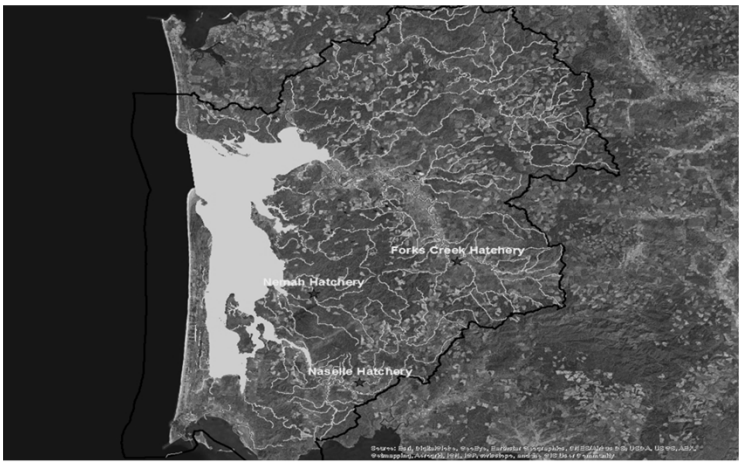
	Point estimate	Bootstrap mean	Bootstrap cv	90% lower bound	90% upper bound
α	8.23	8.39	30.4%	4.81	13.04
β	0.0000432	0.0000432	18.7%	0.0000300	0.0000565
S_{MSY}	17,200	17,400	12.7%	14,300	21,300
F_{MSY}	0.74	.73	8.8%	0.62	0.83

Figure 1. Fit of Ricker spawner-recruit relationship to Willapa Bay coho data including correction for process error. Spawners are in terms of total natural spawners, both hatchery and natural origin. Recruits are in terms of natural origin recruits.



Appendix 4. Willapa Bay Hatchery Assessment Presentation

Willapa Bay Hatchery Evaluation



Chad Herring
Willapa Bay Policy Implementation Biologist

1

Presentation Overview

- **Background**
- **Production**
- **Infrastructure needs**
- **Hatchery reform**
- **Opportunities**
- **Summary**

2

Willapa Bay Hatcheries - Background

Naselle Hatchery

Nemah Hatchery

Forks Creek Hatchery

Hatchery	Year Built	FTE's	Biennial Budget	Funding Source (GF-S/DJ)	Capitol Assessment
Naselle	1980	3.5	$1.2 M	78%/22%	Completed
Nemah	1953	2.39	$545 K	85%/15%	2021-2023
Forks Creek	1899	2.41	$518 K	86%/14%	Completed

WA Dept. of Fish and Wildlife, Information subject to changes and amendments over time

Commission Presentation
August 5, 2016

3

3

Willapa Bay Hatcheries - Production

Species	Naselle	Nemah	Forks Creek	Total
Chinook	2,500,000	3,300,000	350,000	6,150,000
Coho	1,400,000	-	300,000	1,700,000
Chum	300,000	300,000	300,000	900,000
Steelhead	75,000	-	40,000	115,000
Rainbow Trout	-	19,000	4,000	23,000

WA Dept. of Fish and Wildlife, Information subject to changes and amendments over time

Commission Presentation
August 5, 2016

4

4

Willapa Bay Hatcheries - Production

Volunteer Cooperatives

Species	Naselle	Forks Creek	Total
Chinook			
Coho	450,000	750,000	1,200,000
Chum		200,000	200,000
Steelhead		25,000	25,000

5

Naselle Hatchery - Needs

- High risk for catastrophic failure due to failing infrastructure
  - Crusher Creek and Naselle River intakes and supply lines
  - Sediment removal ponds
  - Water pumping inefficiencies
  - Adult holding
  - Fish ladder and weir
  - Incubation/Office building
  - Raceways and ½ acre ponds
  - Pollution abatement pond

6

Naselle Hatchery - Issues

Water Supply Valve Pond #5

Water Supply Valve Pond #1

7

Naselle Hatchery - Renovation

- **Final report for renovation sent to OFM in June 2016**
  - **Initial cost estimates prepared in 2007, $14 M**
  - **Predesign phase**
    - **Cost ~ $23 M**
    - **Funding to move to design and permitting phase**
  - **Rebuild**
    - **New intakes, screening, pumps, settling ponds, and supply lines**
    - **(14)10'x100' and (10) 20'x120' raceways**
    - **Incubation room and abatement pond**
    - **Bridge weir, fish ladder with sampling and presorting area, and adult pond**
    - **Reuse and recycled water**

8

Nemah Hatchery - Issues

- **Weir**
- **Intake**
- **Adult holding pond**
- **Adult trapping**
- **Upgrade supply lines**
- **Bridge**
- **Raceways**
- **Scheduled for predesign in 2021-23 fiscal years**
- **Low stream flow in summer months**

9

Nemah Hatchery - Issues

Nemah Weir

10

Forks Creek Hatchery – Issues

- Possible weir on mainstem Willapa River
- Supply lines to raceways
- Replace fiberglass raceways
- Upgrade pump intake, remove siphon intake and adjacent barrier dam
  - WCRI project $4.4 M
- Adult holding, trapping, sorting, and pollution abatement ponds upgraded in 2014

11

Hatchery Reform

- Integration rates
- Proportion of hatchery fish on spawning grounds for Chinook stocks
- Monitoring and evaluation

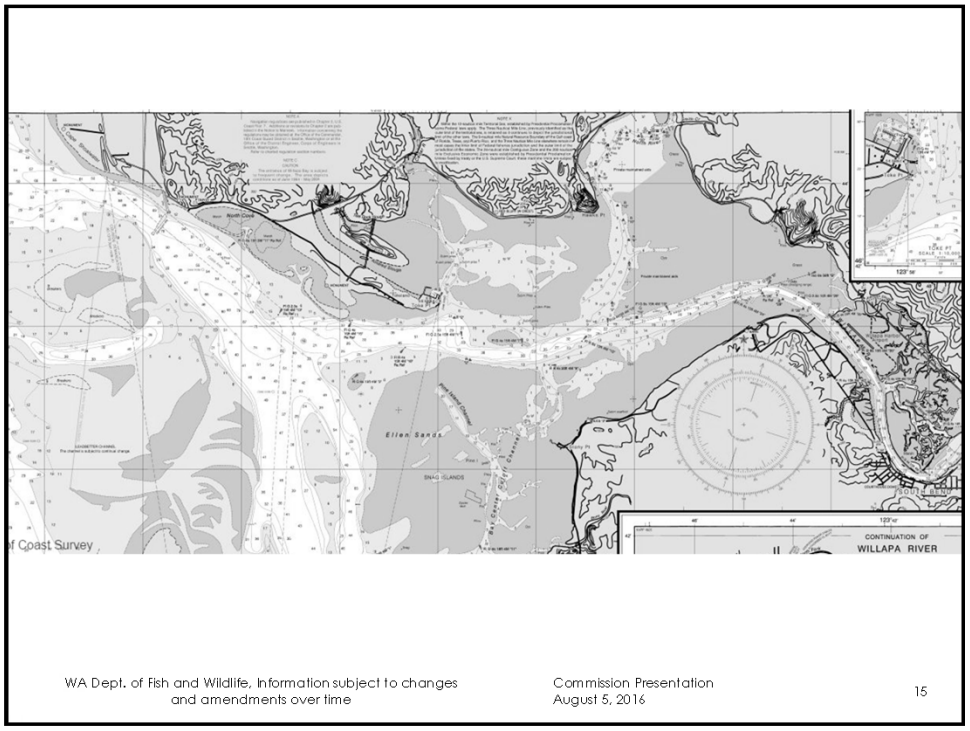
12

Willapa Bay

- **Chum**
  - **Low cost**
  - **Rearing space**
  - **Off station releases and/or increased RFEG participation**
  - **Prey base for Chinook, Coho and Steelhead**
- **Spring Chinook**
  - **Provide spring and early summer fisheries**
  - **Net pen release**
  - **Impacts to native species**

Summary

- **Infrastructure**
  - **Naselle Hatchery**
    - **Renovation**
  - **Nemah Hatchery**
  - **Forks Creek Hatchery**
    - **Evaluation of weir for mainstem Willapa River**
- **Hatchery reform**
- **Other opportunities**
  - **Chum**
  - **Spring Chinook**


Ellen Sands
SNAG ISLANDS
CONTINUATION OF
WILLAPA RIVER
WA Dept. of Fish and Wildlife, Information subject to changes and amendments over time
Commission Presentation
August 5, 2016
15

15

Appendix 5. Ocean Ranching Presentation

Ocean Ranching

Chad Herring
Willapa Bay Policy Implementation Biologist

1

Presentation Overview

- **Background information**
- **RCW's**
- **Potential benefits**
- **Potential issues**
- **Summary**

2

Ocean Ranching

- **Broad definition**
  - **The cultivation of marine organisms under controlled conditions**
- **International Symposium on Stock Enhancement and Sea Ranching**
  - **First held in 1997, 5th symposium was held in 2015**
  - **Restocking, stock enhancement, and sea ranching**
  - **Bell (2008)**
    - **"The release of cultured individuals into unenclosed marine and estuarine environments for harvest at a larger size in put, grow and take operations"**

3

Ocean Ranching

- **Some form of Ocean Ranching used extensively around the world**
- **70 countries stocking over 180 species**
  - **Japan**
    - **90 species ranched or researched for eventual stocking**
  - **Norway**
    - **Cod, European lobster**
  - **Australia**
    - **Barramundi**
  - **Iran**
    - **Sturgeon**
  - **USA**
    - **Pacific Salmon**
- **Salmonids are the most widely stocked group of fish**

4

Ocean Ranching - Japan

- JASFA – Japan Sea-Farming Association
  - 16 National sea farming centers
    - Species/method development
    - Subsidized by national government
  - Regional sea farming centers
    - Production and release of juveniles
    - Funded by fisherman's co-op associations, prefectural/municipal governments and landing tax
  - Local sea farming/Co-op association centers
    - Mostly sedentary species
    - Sale of juveniles
  - Management actions
  - Scientific assessment
  - Bigger role of fishermen
  - Generally regarded as successful

5

Ocean Ranching - Norway

- Norwegian Sea Ranching Program (PUSH)
  - 1990 through 1997
  - Biological and economic bases
  - 4 species
    - Atlantic salmon
    - Arctic charr
    - Cod
    - European lobster
  - Not economically viable
    - NPV analysis
      - Return rates
      - Juvenile costs
- Stock enhancement
  - Cod
  - European lobster

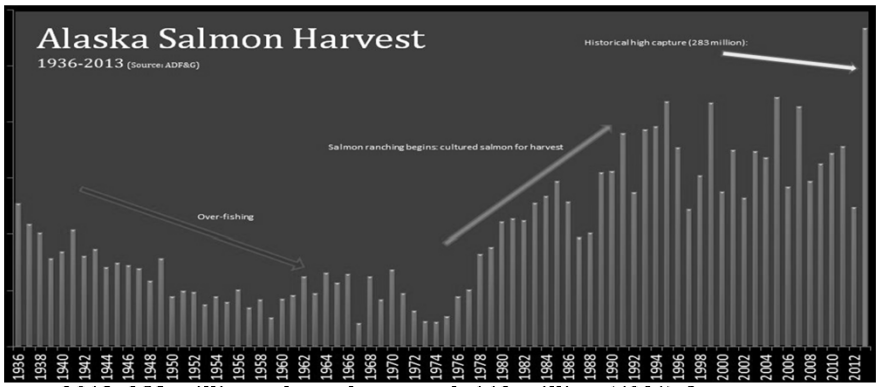
6

Salmon Ranching - Alaska

- **Division of Fisheries Rehabilitation, Enhancement, and Development (FRED)**
  - **Established in 1971**
  - **Manage state hatcheries and promote private hatcheries**
- **Private non-profit hatcheries**
  - **Funded by Enhancement Revolving Loan Fund**
  - **Cost Recovery**
    - **Landing tax**
    - **Special harvest areas**

7

Salmon Ranching - Alaska



- **2013, 283 million salmon harvested, 112 million (40%) from ocean ranching**
- **Economic viability**
- **Hatchery/Wild interactions**
- **Depressed market for hatchery fish**

8

Salmon Ranching - Oregon

- Private for-profit Hatcheries
  - 12 sites at its peak
    - Chinook, Coho, Chum and Pink salmon
    - Fish harvested upon return to the facility
  - No longer in operation
    - Issues
      - Prior interception
      - Economic feasibility
      - Impacts to natural-origin fish

9

Salmon Culture - Willapa Bay

- RFEG's and Volunteer Cooperatives
  - 2016 Future Brood Document
    - 200,000 Chum
    - 1.5 million Coho
  - Un-marked releases
    - Contribution unknown
- Net pen releases
  - Last release in 1998
    - South Bend, Bay Center and Nahcotta
    - Chinook, Coho, Chum and Pink
    - Some tagged releases
    - Predation control
    - Disease
    - Organic waste

10

Ocean Ranching

- **RCW 77.95.260 - Private ocean ranching not authorized**
  - **Released smolts are property of state**
- **RCW 77.95.320 Program utilizing department - partnership agreements to operate and manage certain hatcheries**
  - **State-private partnerships authorized in Hood Canal**
  - **Non-profit, for profit, or federally recognized tribes eligible**

11

Ocean Ranching

- **RCW 77.95.060 - Regional Fisheries Enhancement Groups authorized**
  - **RFEGs can operate facilities on a strictly non-profit basis**
  - **Revenue from surplus fish sales returns to facility for project funding**
  - **Improve salmon resources for all citizens of the state**

12

Potential Benefits

- Local community involvement and conservation incentive
- Opportunity to increase catch
- Provides alternatives in mixed stock fisheries
- Reduce government cost
- Marine derived nutrients
- Small smolts can serve as prey for Coho and Chinook smolts

13

Potential Issues

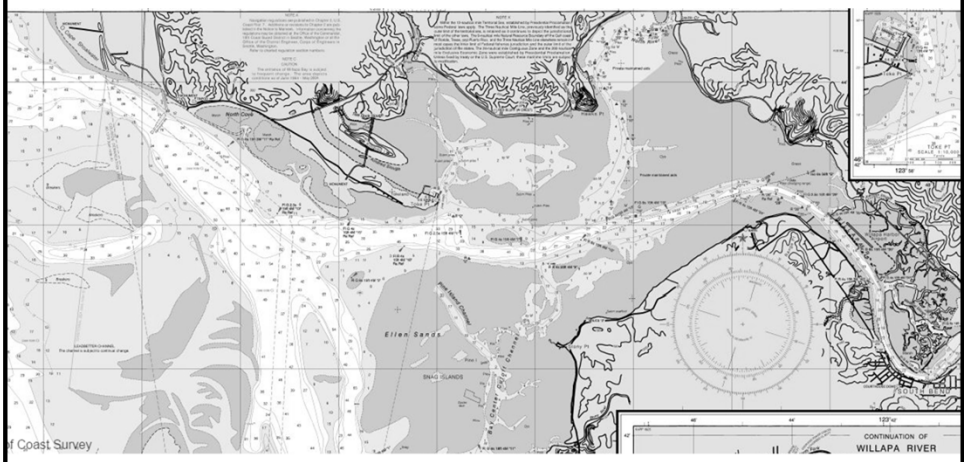
- Impacts to wild fish
- Impacts to other natural resources (shellfish)
- Disease
- Degradation of habitat (water quality)
- Water rights
- Long term source of funding
- Economic viability?

14

Ocean Ranching Summary

- **Multiple forms of Ocean Ranching used worldwide**
- **Economic viability is unclear**
- **Not legal in Washington State**
- **Costly Start-up and M & E**
- **Can be used to increase harvest**
- **Ecological benefits/issues**
- **Hatchery/Wild interactions**

15



16

Appendix 6. Willapa Bay Salmon Advisory Group Meetings

WILLAPA BAY POLICY PUBLIC WORKSHOP

JANUARY 23, 2018 6 p.m. – 8 p.m.

Raymond Elks Lodge, Raymond, WA

Assumptions used to create the Willapa Bay Policy:

- Encounter ratios generated from proportion abundances – used to estimate encounters and impacts in a mark selective fishery
- The Chinook harvest rate in Marine Area 2.1 recreational fishery would increase by 30%, resulting in approximately a 3.2% harvest rate for the marine area.
- The Chinook harvest rate in the freshwater areas would increase by 5-10%.
- Commercial alternative gear use
- Weir efficiency and stray rate
- Productivity
- Ocean conditions

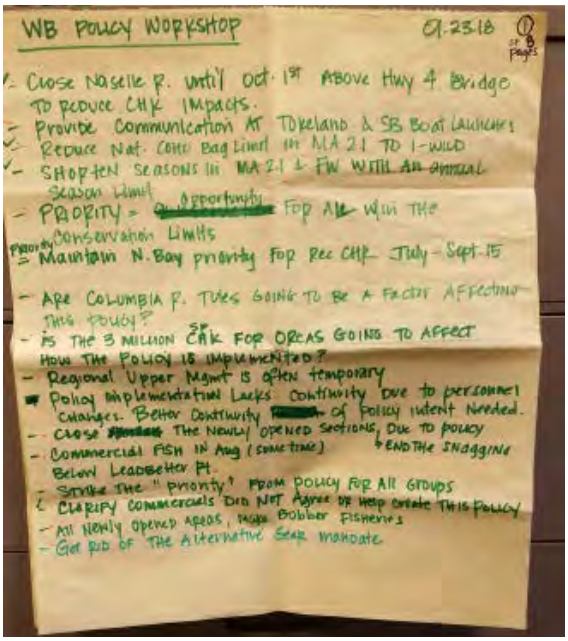
Goals set forth in the Willapa Bay Policy:

Fishery management objectives for Fall Chinook, in priority order:	Fishery management objectives for Coho, in priority order:
Achieve spawner goals for North, Naselle, and Willapa river stocks of natural-origin and hatchery reform broodstock objectives through two phase rebuilding program	Manage fisheries with the goal of achieving the aggregate spawner goals for natural-origin Coho
Provide for an enhanced recreational fishing season	Prioritize commercial fishing opportunities during Sept. 16 – Oct. 14
Provide opportunities for commercial fisheries within the remaining available fishery impacts	Provide recreational fishing opportunities

Based on these assumptions that created the policy and the goals set forth in the Willapa Bay Policy, the Department would like to ask you for your input to a few questions:

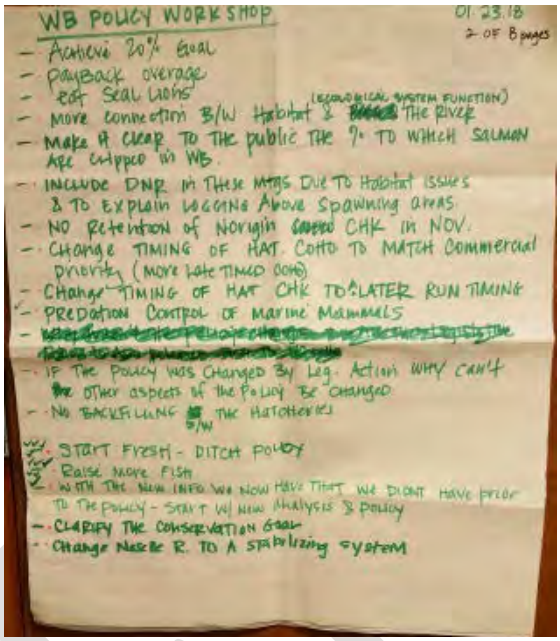
1. What does priority mean to you?
2. What is or is not working with the Willapa Bay Policy?
3. What is working or not working with implementation of the WB Policy?
4. What else could we be doing to meet our management, conservation, or policy objectives? Is there anything you think we have not thought of or are missing in the policy?

If you have any other comments you would like to provide to WDFW, please email those comments to WillapaBay@dfw.wa.gov



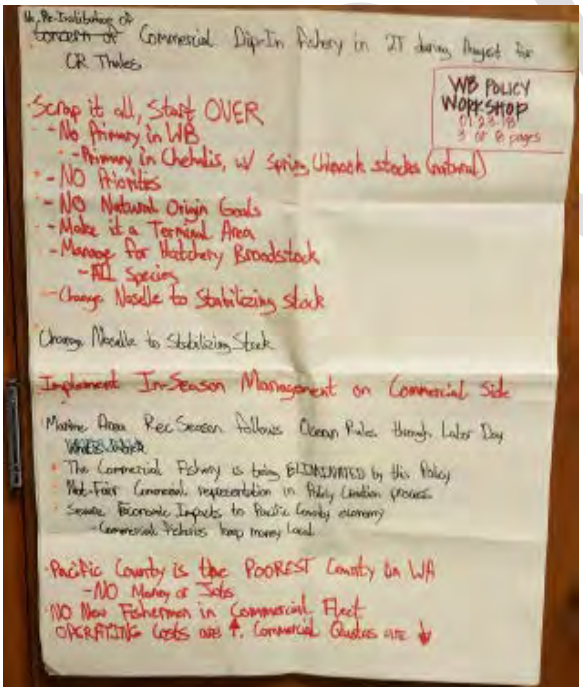
WB POLICY WORKSHOP 01-23-18 1 OF 8 pages

- Close Naselle R. until Oct 1st Above Hwy 4 Bridge To reduce CHK Impacts.
- Provide Communication AT Tokeland & SB Boat Launches
- Reduce Nat. Coho Bag Limit in MA 2-1 TO 1-WILD
- Shorten Seasons in MA 2-1 & FW WITH An annual Season Limit
- PRIORITY = [redacted] Opportunity FOR All With THE Conservation Limits
- Priority = Maintain N. Bay priority FOR Rec CHK July - Sept 15
- Are COLUMBIA R. TWEs GOING TO BE A FACTOR AFFECTING THIS POLICY?
- IS THE 3 MILLION SP CHK FOR ORCAS GOING TO AFFECT How The Policy IS IMPLEMENTED?
- Regional Upper Mgmt IS often temporary
- Policy Implementation Lacks Continuity Due to personnel changes. Better Continuity [redacted] of Policy Intent Needed.
- Close [redacted] The Newly Opened Sections, Due to policy & END THE SNAGGING Below Leadbetter Pt.
- Commercial FISH IN Aug (some time)
- Strike The " priority" FROM POLICY FOR All GROUPS
- CLARIFY Commercials Did NOT Agree OR Help create This Policy
- All Newly Opened Areas, Make Bobber Fisheries
- Get RID OF The Alternative Seas mandate



WB POLICY WORKSHOP 01.23.18 2 OF 8 pages

- Achieve 20% Goal
- payback overage
- eat Seal Lions
- More connection B/W Habitat & [redacted] The River (ECOLOGICAL SYSTEM FUNCTION)
- Make it clear TO The public THE % TO WHICH SALMON Are trapped in WB.
- INCLUDE DNR IN These MTGS Due TO Habitat ISSUES & TO EXPLAIN LOGGING Above Spawning Areas
- NO Retention of Nonagin [redacted] CHK IN NOV.
- Change TIMING OF HAT COHO TO MATCH Commercial priority (MORE late TIMED COHO)
- Change TIMING OF HAT CHK TO LATER RUN TIMING
- PREDATION CONTROL OF Marine Mammals
- [redacted]
- IF The Policy WAS Changed By Leg. Action WHY CAN'T The OTHER ASPECTS OF The Policy BE Changed
- NO BACKFILLING IN/W THE HATCHERIES
- START FRESH - DITCH POLICY
- Raise More FISH
- WITH The NEW INFO We NOW HAVE THAT WE DIDN'T HAVE PRIOR TO The POLICY - START W/ NEW ANALYSIS & POLICY
- CLARIFY The CONSERVATION GOAL
- Change Naselle R. TO A stabilizing system



Re-Initiation of ~~Consult~~ of Commercial Dip-In Fishery in 21 during August for CR Tribes

WB POLICY WORKSHOP 01.23.18 3 OF 8 pages

- Scrap it all, Start OVER
- No Primary in WB
- Primary in Chehalis, w/ Spring Chinook stocks (natural)
- NO Priorities
- NO Natural Origin Goals
- Make it a Terminal Area
- Manage for Hatchery Broodstock
- All Species
- Change Naselle to Stabilizing Stock

Change Naselle to Stabilizing Stock

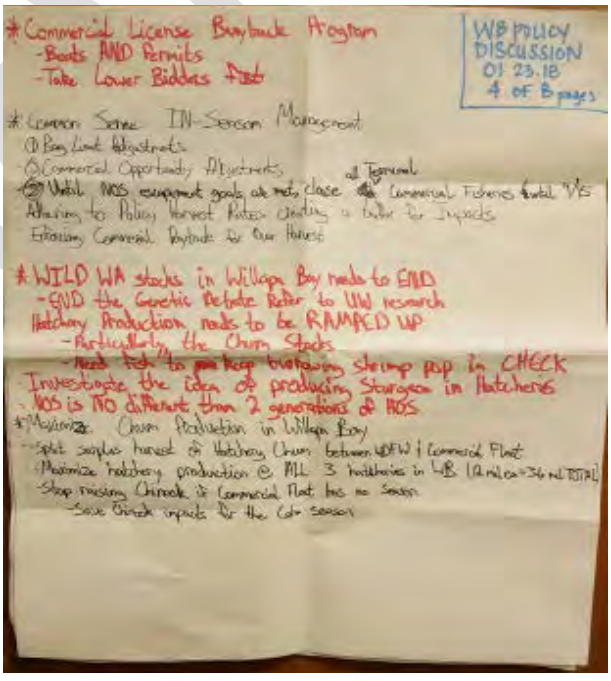
Implement In-Season Management on Commercial Side

Marine Area Rec Season Follows Ocean Rules through Labor Day

- The Commercial Fishery is being ELIMINATED by this Policy
- Not Fair Commercial representation in Policy Creation process
- Severe Economic Impacts to Pacific County economy
  - Commercial Fisheries keep money Local

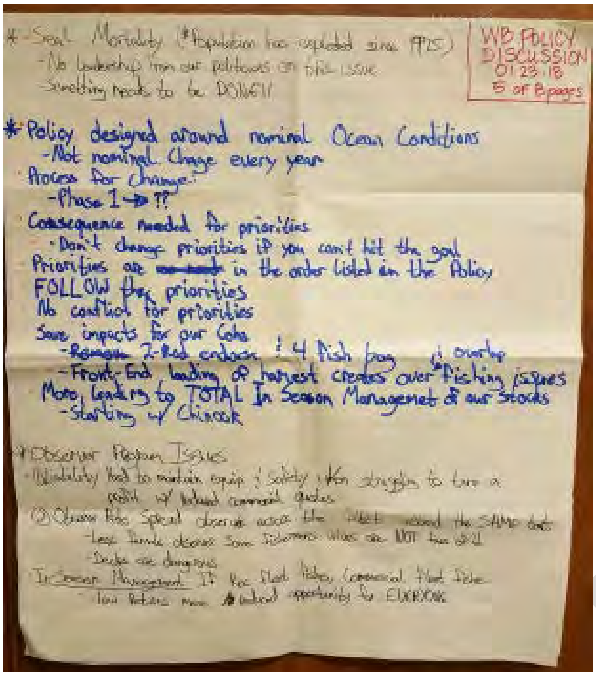
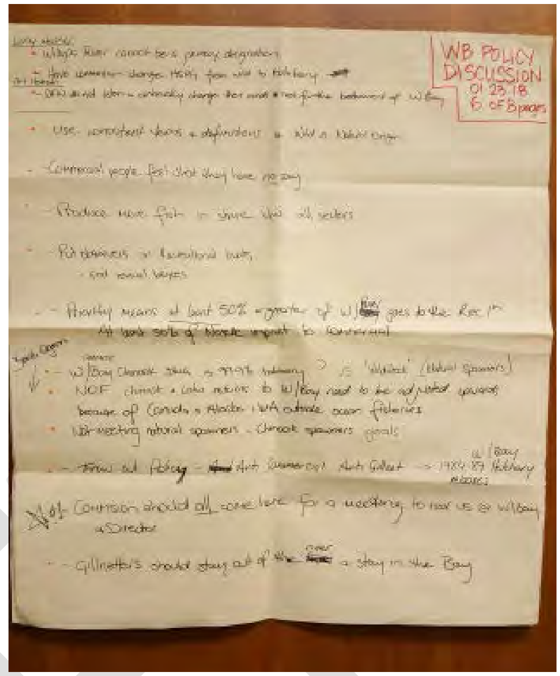
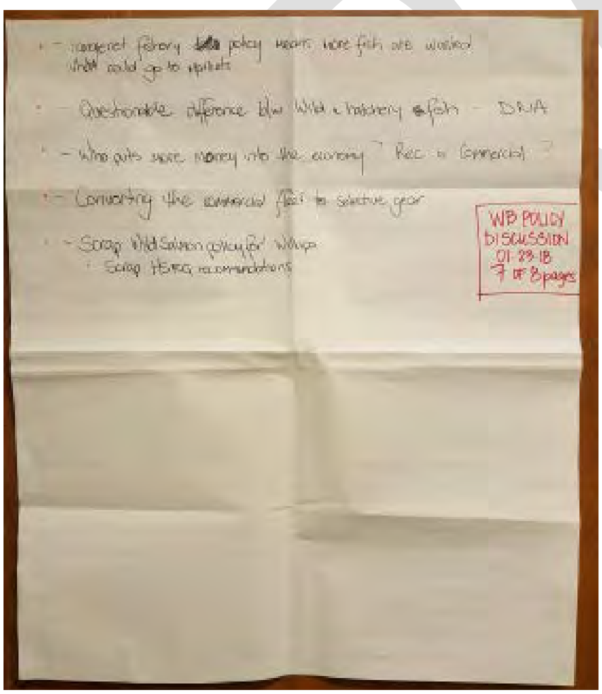
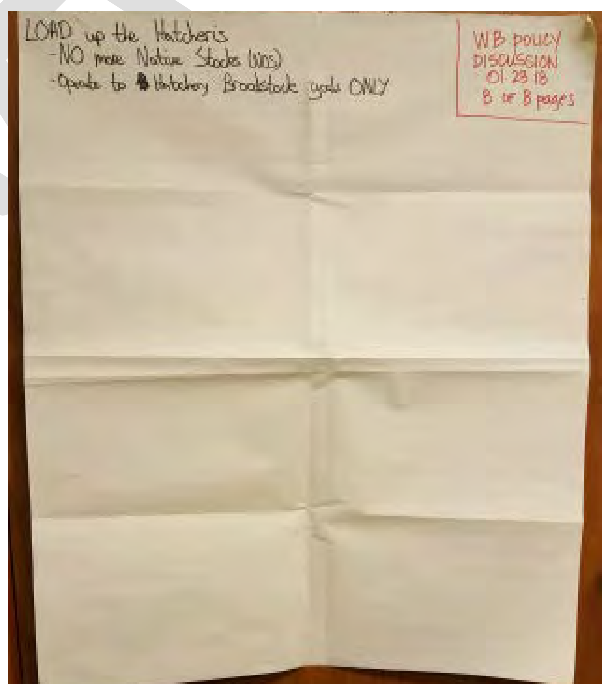
Pacific County is the POOREST County in WA
- NO Money or Jobs

NO New Fishermen in Commercial Fleet
OVERHEAD Costs are ↑. Commercial Quotas are ↓



WB POLICY DISCUSSION 01.23.18 4 OF 8 pages

* Commercial License Buyback Program
  - Boats AND Permits
  - Take Lower Bidders First
* Common Sense IN-Season Management
  - ① Bag Limit Adjustments
  - ② Commercial Opportunity Adjustments
  - ③ Until MOS escapement goals are met, close all Terminal Commercial Fisheries Total MFS Abiding to Policy Harvest Rates Creating a Buffer for Impacts Entering Commercial Buyback for Our Rivers
* WILD WA stocks in Willapa Bay needs to END
  - END the Genetic Debate Refer to UW research
  - Hatchery Production needs to be RAMPED UP
    - Particularly the Chum Stocks
    - Need fish to [redacted] keep predators shrimp pop in CHECK
  - Investigate the idea of producing Sturgeon in Hatcheries
  - MOS is NO different than 2 generations of HOS
* Maximize Chum Production in Willapa Bay
  - Split samples harvest of Hatchery Chum between WDFW & Commercial Fleet
  - Maximize hatchery production @ ALL 3 hatcheries in WB (2 mil ea = 36 mil TOTAL)
  - Stop raising Chinook in Commercial Float has no Season
    - Save Chinook impacts for the Ocn season


WB POLICY DISCUSSION 01 23 18 5 OF 8 pages
Policy designed around nominal Ocean Conditions
-Not nominal. Change every year
Process for Change
-Phase 1 → ??
Consequence needed for priorities
Don't change priorities if you can't hit the goal
Priorities are in the order listed in the Policy
FOLLOW the priorities
No conflict for priorities
Save impacts for our Coho
-Front-End loading of harvest creates over fishing issues
More, Leading to TOTAL In Season Management of our Stocks
-Starting w/ Chinook
Observer Program Issues
In-Season Management

WB POLICY DISCUSSION 01 23 18 6 OF 8 pages
Commercial people feel that they have no say
Produce more fish in share w/ all sectors
Priority means at least 50% or greater of W/Bay goes to the Rec
Gillnetters should stay out of the river & stay in the Bay

Questionable difference b/w Wild & hatchery fish - DNA
Who puts more money into the economy? Rec or Commercial?
Converting the commercial fleet to selective gear
Scrap Wild Salmon policy for Willapa
Scrap HSRG recommendations
WB POLICY DISCUSSION 01 23 18 7 OF 8 pages

LOAD up the Hatcheries
-NO more Native Stocks (WNS)
-Operate to Hatchery Broodstock goals ONLY
WB POLICY DISCUSSION 01 23 18 8 OF 8 pages

Willapa Bay Policy Public Workshop Summary of Public Comments:

January 23, 2018

Public Individuals in attendance: 38

(#) = number of additional individuals who supported the comment

Priority

- Priority is opportunity for all within the conservation limits
- Priority means to maintain north bay priority for rec Chinook July – Sept. 15
- Strike the priority from the policy for all groups
- No priorities
- Consequence needed for priorities
- Don't change priorities if you can't hit the goal
- Priorities are in the order listed in the policy. Follow the priorities. There is no conflict for priorities.
- Priority means at least 50% or greater with river goes to the recreational
- At least 50% of Naselle impacts to commercial

Commercial

- Commercial sector feel that they have no say
- Commercial fish in August (some time) below Leadbetter Point
- Get rid of the alternative gear mandate
- No re-institution of commercial dip-in fishery in 2T during august for Columbia River Tules
- The commercial fishery is being eliminated by this policy
- Pacific County is the poorest county in WA. No money or jobs. No new fishermen in the commercial fleet. The operating costs are high, and the commercial quotas are low.
- Commercial license buyback program. Boats and permits. Take lower bidders first.
- Gillnetters should stay out of the river and stay in the bay.
- Tangle net fishery – policy means more fish are wasted that could go to market
- Converting the commercial fleet to selective gear
- Observer program issues:
    - Liability – hard to maintain equipment and safety when struggling to turn a profit with reduced commercial quotas.
    - Spread observers across the fleet instead of the same boats.
    - Less female observers. Some fishermen's wives are not fans of it.
    - Decks are dangerous.

Recreational Regulations

- Close Naselle River until Oct. 1st above Hwy 4 Bridge to reduce Chinook impacts (1)
- Reduce natural coho bag limit in Marine Area 2.1 to 1-wild (1)
- Shorten season in Marine Area 2.1 and freshwater with an annual season limit (1)
- Close the newly opened sections due to the policy to end the snagging
- If you keep these newly opened sections, make them bobber fisheries
- No retention of natural-origin Chinook in November

- Marine Area recreational season follows Ocean Rules through Labor Day
- Save impacts for our coho; 2 rod endorsement and 4 fish bag
- Put observers on recreational boats and revival boxes

Policy

- Clarify commercial sector did not help create this policy or agree with this policy (1)
- Not fair commercial representation in policy creation process
- Ditch the policy and start fresh (4)
- With the new information we now have that we didn't have prior to the policy, start with a new analysis and policy (1)
- Scrap it all and start over
- Clarify the conservation goal
- Are Columbia River Tules going to be a factor affecting this policy?
- Is the 3 million chinook for orcas going to affect how this policy is implemented?
- Achieve 20% goal
- Pay back overage
- If the policy was change by legislative action, why can't other aspects of the policy be changed?
- Change Naselle River to a stabilizing system (2)
- No primary in Willapa Bay. Put the primary in Chehalis with spring Chinook stock (natural)
- No natural origin goals
- Make it a terminal area
- Severe economic impacts to Pacific County economy. Commercial fisheries keep money local
- Manage to hatchery broodstock for all species
- Implement in-season management on the commercial side
- Common sense in-season management
    - Bag limit adjustments
    - Commercial opportunity adjustments
    - Until NOS escapement goals are met, close all terminal commercial fisheries until 9/15
    - Adhering to policy harvest rates creating a buffer for impacts
    - Enforcing commercial payback for over harvest
- Wild WA stocks in Willapa Bay needs to end. End the genetic debate. Refer to UW research.
- Split surplus harvest of hatchery chum between WDFW and commercial fleet
- Stop raising Chinook if the commercial fleet has no season. Save Chinook impacts for the coho season
- Policy designed around nominal ocean conditions. Those are not nominal and change every year.
- Process for change? Phase 1 – then what?
- Front end loading of harvest creates overfishing and overlapping of issues leading to total in-season management of our stocks starting with Chinook.
- In-season management – if recreational fleet fishes, commercial fleet fishes.
- Low returns mean reduced opportunity for everyone.
- Willapa River cannot be a primary designation
- Have Commission change HSRG from wild to hatchery
- Use consistent term and definition i.e. wild vs natural origin

- Premise – WB Chinook DNA is 99.9% hatchery vs wild stock (natural spawners). NOF Chinook and coho returns to WB need to be adjusted upwards because of Canada and Alaska (WA outside ocean fisheries).
- Questionable difference between wild and hatchery fish - DNA
- Not meeting natural spawners – Chinook spawner goals
- Throw out the policy – anti-commercial, anti-gillnet (1984-89 WB hatchery releases)
- All commissioners and Director should all come here for a meeting to hear us with WB
- Who puts more money into the economy? Recreational or commercial?
- Scrap wild salmon policy for WB
- Scrap HSRG recommendations

Hatchery Production

- Make it clear to the public the percent to which salmon are clipped in Willapa Bay
- Change timing of hatchery coho to match commercial priority (move late timed coho)
- Change timing of hatchery chinook to a later run timing
- No backfilling between the hatcheries
- Raise more fish (5)
- Hatchery production needs to be ramped up, particularly chum stocks
- Need more fish to keep burrowing shrimp population in check
- Investigate the idea of producing sturgeon in hatcheries
- NOS is no different than two generations of HOS. Maximize chum production in Willapa Bay.
- Maximize hatchery production at all three hatcheries in WB (12 mi each= 36 mi total)
- Produce more fish to share between all sectors
- Load up the hatcheries. No more native stocks (NOS).
- Operate to hatchery broodstock goals only.

Habitat

- More connection between habitat and the river (ecological system function)
- Include DNR in the meetings due to habitat issues and to explain logging above spawning areas

Marine Mammals

- Predation control of marine mammals (1)
- Eat sea lions
- Seal mortality – population has exploded since 1975. No leadership from our politicians on this issue. Something needs to be done.

Miscellaneous

- Provide communications at the Tokeland and South Bend boat launches
- WDFW do not listen and continually change their minds, not for the betterment of Willapa Bay
- Regional upper management is often temporary. Policy implementation lacks continuity due to personnel changes. Better continuity of policy intent needed.

Willapa Bay Salmon Advisory Group

August 22, 2018 6 p.m. – 8 p.m.

Region 6 office Montesano, WA

Staff: Kirt Hughes, Larry Phillips, Chad Herring, Barbara McClellan, Lyle Jennings

Advisors: Marlisa Dugan, Ross Barkhurst, Jim Sayce, Steve Boerner, Bob Lake, Norm Reinhardt, Andy Mitby, Jack Hollingsworth, Jess Helsley, Greg McMillan, Lance Gray, Tim Hamilton, Francis Estalilla (via phone)

Public: 1 Individual

Chad:

- Overview of Agenda
- Introductions
- Advisory Group Handbook – page 6 specifically
- Emails on website on advisory group page
    - Update contact info – some info is incorrect
- Policies and guidance
- Data spreadsheets

Larry: Agency budget situation

- Started with a $420 million statewide budget in previous years
- 50% cut after 9/11
- 2017-19 budget provided with $10 million short term fix with provisos
    - Organizational Agency assessment to look for efficiencies
    - Asked to look at Zero based budget – shows services agency provides and discretionary funds. Cuts become difficult and complicated because of these discretionary funds.
    - No recreational fee increases in about eight years, but services increase in cost for inflation
- Go to website for more information, Nate Pamplin webinar

❖ There is an August 31, 2018 conference call scheduled where the agency/Commission will be asking legislature for money for budget

- Encourage public to talk with Commission
- Agency has a Budget Policy Advisory Group
- Agency is trying to provide opportunity where we can but conservation (ie. ESA) comes first and the complications of fish runs (low runs) will continue in the future.
- Hatchery production changes - There are no conservation issues for trout here in WA. More anglers fish for trout in WA than salmon. Trout programs have taken significant cuts as well.

Kirt: Policy Review

- Commission is looking to review or do a re-evaluation of different policies to find where we are making progress and where we are not. i.e. HSRG C-3619 2018 Guidance

- Agency is providing updated science to the Commission as it comes up. It is about providing what we know now compared to what we knew at the time a policy was created.
- Elements of the HSRG policy have been suspended (not the entire policy) but the agency will continue to use sound science to stay within compliance of conservation objectives.

❖ Provide Letter from Commission

Southern Resident Killer Whales (SRKW)

- Complicated issue
- Issues: Prey availability, Pollution, & Noise/disturbance
- Agency doesn't have the authority to close an area solely to vessel traffic
- Prey availability is the one piece the agency can adjust.
    - Where can hatchery production be changed?
    - Which hatcheries have room for additional production?
    - Do these hatcheries have conservation issues?
- Give input to those members on the Orca Task Force or subgroups

Advisor comments:

- Need to get fish from Alaska back down to feeding grounds in WA for whales

- Water availability and water quantity are currently an issue so even if some facilities can hold a certain number of fish, they shouldn't hold that many fish because of water issues.

- is the department looking at alternative ways to harvest the fish that are a result of any increases in production due to SRKW to maintain a good level of pHOS?

Chad:

In-season Review:

- Recreational Monitoring to-date and comparison to preseason
    - No quota for the recreational marine fishery
    - Monitoring is a tool to evaluate fishery
    - Some recreational fishers have been abusive to creel staff. We need the most accurate data in order to provide the best estimate. Agency would appreciate the recreational advisors to get the word that there is no need to abuse staff.
    - The agency will initiate contact with this group when it comes to any in-season actions via conference call. Some of those actions will require quick responses because time may be the limiting factor.
    - This group will be involved in more than just North of Falcon.
    - Preseason projection was created using an average CRC where the in-season estimate is using the data collected from the creel sampling on the dock this year.

Willapa Bay Policy Review:

- This did not just come up. It was already set in the policy when it was created (see page 8-9 in the WB Salmon Mgmt Policy C-3622
- Going to use a similar process that Columbia River used
- Are there questions that the Commissioner have requested answers to?

- This group is going to use a quorum, meaning 2/3 of the group need to agree to have an idea moved forward for conversation or included in the policy review. We need to come together as a group in order to still meet conservation objectives and be able to still prosecute fisheries. We need to think about sustainable means to get there. This is going to be a flexible depending on what comes up.
- Provide comments from the group on what is working and what is not working?
- This group and the agency need to find a better way to collaborate to move forward with our shared objectives.
- In the interest of for full disclosure, the agency has been approached by the Wild Fish Conservancy to use a fish trap. The WFC has been told that the agency has no budget to contribute. They would like to put this trap in the Willapa River for 2020. WFC is looking for grant monies. No proposal has been provided to the agency at the point, so no details are not available right now.
- It is important that we are constantly evaluating what we are doing and if that is the correct thing to do. Are we using the right tools? Are we implementing HSRG in the right way?
  The agency has not done away with the HSRG policy. Conservation is the priority. We need to make common sense decisions while balancing all of the issues.

- A full review of HSRG will likely be completed next summer. Public input will be taken.
- Fact sheet?

<u>Advisor comments:</u>

- We want to know more about what the department's position is on different topics. We never hear that.
- Does the quorum only include those members present or the whole group each time regardless of whether they are present?
- Alternative gears are segmented to only a few people not the entire group of commercial fishermen.
- It is a feasibility study using a stake net in conjunction with the commercial gillnetters. They are not looking to kick anyone out of the fishery.
- Priority in the policy needs to be removed because it causes too much of a problem.
- How many fish will return as a result of any Orca increases in order to do a cost analysis? How much will it cost and how long will it feed the orcas?

➢ Next meeting – will send doodle pool to advisory members with a range of dates to choose from

Willapa Bay Salmon Advisory Group

September 14, 2018 6 p.m. – 8 p.m.

Region 6 office Montesano, WA

Staff: Kirt Hughes, Chad Herring, Annette, Hoffmann, Barbara McClellan

Advisors: Marlisa Dugan, Ross Barkhurst, Jim Sayce, Steve Boerner, Norm Reinhardt, Andy Mitby, Jack Hollingsworth, Jess Helsley, Greg McMillan, Lance Gray, Tim Hamilton, Francis Estalilla

Public: 3 Individuals

- Review of agenda
- Public Workshop Comments from 01/23/18
- Advisor Comments Provided to WDFW for Policy Review
- Policy Guiding Principles
    - Conservation & Restoration (fish vs habitat)
        - Fish to gravel
        - Avoid ESA designation - 100 years viability from NOAA
        - Natural vs hatchery and natural origin spawners vs naturally spawning = NOS / HOS
        - Policy intent to natural fish to yield hatchery fish without punishing gravel
        - Natural origin spawners (NOS) should be the metric for everything we do
        - Create an RCW with definitions of terms
        - Genetics study did not show differences
        - East coast Cod collapse
        - Still at ground zero for recovery
        - HSRG principles should be in policy
        - Relation of WB policy principles to HR policy amendments
        - Temporary suspension
        - RCW on HSRG?
        - Need definitions
        - What happens to Guiding principle #3?
        - Orca response relative to guiding principles
        - Does that mean we lose another year?
        - Delay process on WB policy review
        - Parking lot for items that need more
        - Orca production pathways
        - Add language for northern intercepts - Include signals from outside
        - As population declines (#8), PSF will be too high, change to trigger on changing preseason runsize instead of catch
        - ISU actions
    - Economic harvest benefits
        - Allocation to state vs local to Willapa Bay (Policy #5 & 6)
        - Stricter than actually having an ESA listed species to avoid ESA designation
        - Timeline trajectory / ESA goal

        - Timeline needed for progress (16 – 21 years)
        - Commercial payback for overharvest in the past
        - Need to look at restrictions to both fisheries (recreational and commercial) – restrictions should be shared
        - Alternative gears, not traps or pound nets etc, don't want to privatize fishery
        - ISU actions should allow for expanding seasons if runsize goes up
        - Evaluate efficiency of alternative gears
    - Transparency & public trust
    - Recreational fishery update
        - Lower than predicted Chinook impacts
    - Commercial fishery update
        - Coho higher than predicted
        - Lower than predicted Chinook impacts
    - Naselle Hatchery Rack Return
        - Higher returns to-date are higher than last three years in week 37
        - About 30 coho
        - Need about 1000 females for broodstock
    - Nemah Hatchery returns
        - High push of Chinook this past Wednesday, around 1000 fish
        - No coho yet
        - Similar to Naselle, 1210 females needed to make broodstock
    - Forks Creek return
        - Low right now, still early
    - Mixed signals for Chinook
        - Ocean catch was low because they caught their coho first.
        - Columbia closed this week.
        - North Coast similar to expected
        - Inside WB, below expectations but rack returns high
        - Don't think we have enough information/data to make any changes right now. Peak of WB Chinook is week 38 for hatchery and week 40-41 for natural. Proportions have shifted in the commercial fishery yesterday. So is there any Chinook to follow?
        - Collect more data and re-evaluate next week. Commercial fishery will open to four areas on Monday so we will have a better idea of the run timing.
    - Have received several suggestions for the commercial fishery from closed completely to adding a few days since the impacts were not used.

<u>Advisor Comments:</u>

- Will we make the 20% harvest rate if the runsize is lower and not make any changes to fisheries?
- Disagree to no in-season management right now. Still need to make a downward adjustment on the Nemah bag limit from 4 adults to 3 or 2 adult fish.
- Cannot support any additional days to the commercial fishery. (2Xcomment)
- No retention in FW until we get brood at the hatcheries. Supportive of commercial suggestion.

- The commercial proposal is for priority on Coho not Chinook. Effort has been very low so below predicted (2Xcomment).
- Commercial proposal violates allocation of impacts between sectors (commercials limited to 9%).
- Nemah River reduction down to 2 adult fish (2Xcomment)
- Need reduction to the commercial fishery
- No action should be taken on commercial proposal until we know more (3Xcomment)
- If we see that the return is low over the next 10 days (prime time), all fisheries in WB should close (recreational and commercial) until we make egg take (2Xcomment)
- The commercial proposal was submitted only if the fish were available. It may not happen this week or next.
- Maybe we should start with a smaller bag limit then increase.
- If the fish aren't there, the commercials won't fish anyway.
- Preseason need to plan for 9% but in-season we can be adaptive within the total 20%.
- Would like some additional data on pinniped populations?
    - The pinniped populations are at the same capacity as the last 30 years. There are a few hot spots though.
    - Federal Law in play. State has no management authority.
- Commission passed a budget request to increase hatchery production. Were Willapa facilities included on that? Follow up.
- Easiest is human interaction with salmon to increase fish to SRKW.
- Tracking? Tags for Spring Chinook? Will it make a difference?

- Southern Resident Killer Whales (SRKW) – 2 documents provided in packet.
- Funding sources – emergency funds &
- Forks Creek – has the ability of raising an additional 3 million
    - Given issues of hatchery and natural interactions in the gravel, considering with NOAA is Spring Chinook. In HSRG, Spring Chinook will not be a problem according to NOAA.
    - Survival is non-existent in Willapa River for returning adults because of water flows, water temps, and?? Smolt to Adult Return is about 0.33%.
    - Sub-yearling from Kalama. Return timing would be April/May. Timing would be there for whales when they are off the coast. Greater viability for SRKW.
    - Virology testing would be necessary.
    - A release of 1 million Spring Chinook would return around 3,000 fish across the bar.
        - Need to look at surrogate Spring Chinook stocks using CWT's.

Non-Advisor Public Comments:

- We could get 10K back to the Willapa basin. Fish come and go in cycles
- Tangle nets are not effective in clear water.
- Handouts to public as well.
- Need a week of commercial fishery to know what is actually happening once the entire fleet is fishing.
- How much difference will catch 2 fish help the Nemah system? What are the chances of catch 3 or 4 fish?
- Commercial fishery had coho retention, but recreational fishery only had one fish coho retention

- The control zone limited recreational fishery. Charters fished just outside control zone. We are protecting fish that Columbia pays very little.
- Does the agency have a quota of Columbia River Tules?

Willapa Bay Salmon Advisory Group

October 24, 2018 6 p.m. – 8 p.m.

Region 6 office Montesano, WA

Staff: Chad Herring, Barbara McClellan, Lyle Jennings

Advisors: Bob Lake, Tim Hamilton, Ross Barkhurst, Jess Helsley, Lance Gray

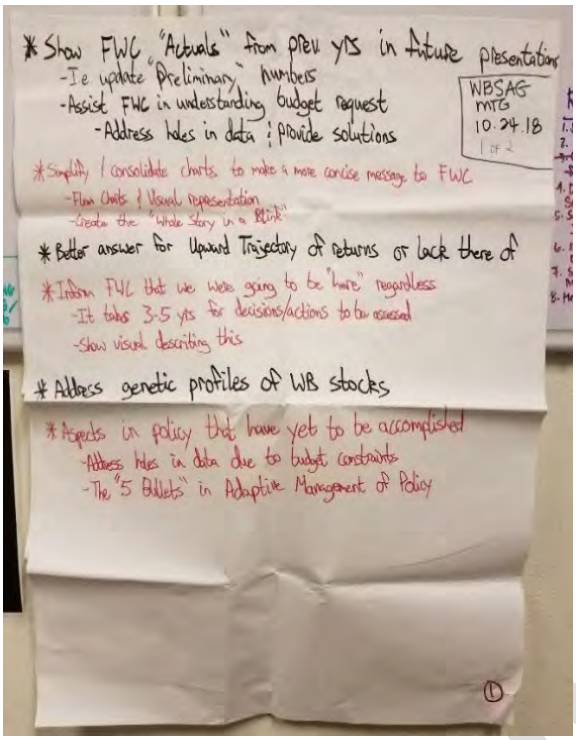
Public: 1 Individual

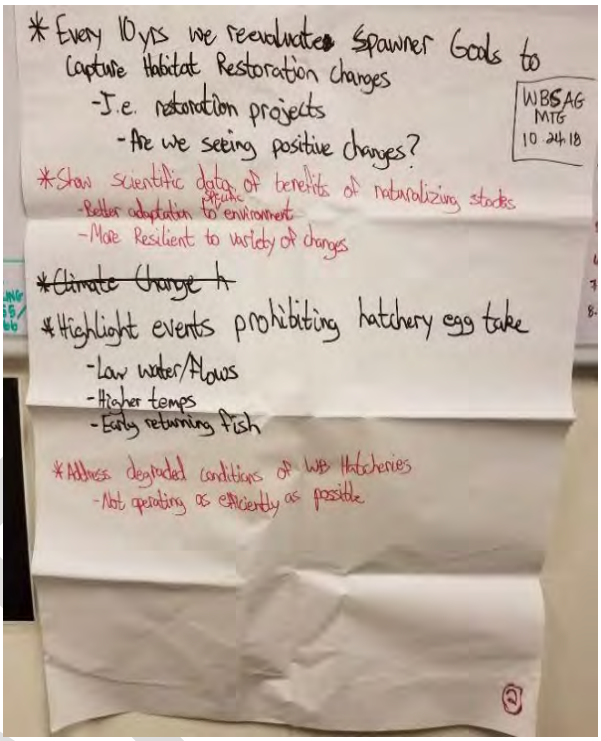
Chad: Opening statements

- Walked through the upcoming Commission Presentation for Nov. 2, 2018 in Vancouver
- Overview of main slides from the Commission Presentation of the 2015 Fishery Review on Feb. 27, 2016
- All other previous presentations from 2016 – 2017 that were provided tonight are in the same format of the 2015 Fishery Review

Advisor Comments:

- In subsequent presentations, update the data to final post fishery review from the previous year and include it so that FWC knows where the data actually ended up relative to the previous year's presentation, which is usually preliminary.
- Need to assist FWC of the budget issues then show how those issues affect the constraints of implementing the policy in order to address holes in the data to provide solutions.
- FWC presentations seem difficult to understand given the amount of data included. Only some things are truly important to present. Charts/graphs seem easier to provide data. Simplify and consolidate data by including multiple data on the same graph.
- Better answer for upward trajectory of returns or lack there of
- Show the FWC where we actually are with natural-origin Chinook escapement in graph form for 16 – 21 years relative to goal. Start with 2010 data.
- Address genetic profile of WB stocks and what did the analysis show
- Show data regarding the benefit of naturalizing stocks or domestication of species adapting to any specific environment. More resilient to a variety of changes.
- The policy directs the agency to complete specific tasks by specific dates but some of those tasks have not been accomplished. Address holes in the data due to budgets constraints. State to the FWC what the constraints are for those tasks and why the agency has not completed those. These tasks are in the Adaptive Management section of the policy.
- Because of habitat restoration, review spawner escapement goals every so many years, i.e. every 10 years. Are there any positive changes?
- Highlight to the FWC the issue of low flows and higher temperatures and how these events will likely prohibit future hatchery egg take especially for Chinook
- Update previous review of our hatcheries. Highlight the degraded conditions at the WB hatcheries and why they are not operating as efficiently as possible.


* Show FWC "Actuals" from prev yrs in future presentations
-I.e update "Preliminary" numbers
-Assist FWC in understanding budget request
-Address holes in data ; provide solutions
WBSAG MTG 10.24.18
* Simplify / consolidate charts to make a more concise message to FWC
-Flow Charts & Visual representation
-Create the "Whole Story in a Blink"
* Better answer for Upward Trajectory of returns or lack there of
* Inform FWC that we were going to be "here" regardless
-It takes 3-5 yrs for decisions/actions to be assessed
-Show visual describing this
* Address genetic profiles of WB stocks
* Aspects in policy that have yet to be accomplished
-Address holes in data due to budget constraints
-The "5 Billets" in Adaptive Management of Policy


* Every 10yrs we reevaluate Spawner Goals to Capture Habitat Restoration changes
-I.e. restoration projects
- Are we seeing positive changes?
WBSAG MTG 10.24.18
* Show scientific data of benefits of naturalizing stocks
-Better adaptation to environment
-More Resilient to variety of changes
* ~~Climate Change ?~~
* Highlight events prohibiting hatchery egg take
-Low water/flows
-Higher temps
-Early returning fish
* Address degraded conditions of WB Hatcheries
-Not operating as efficiently as possible

Willapa Bay Salmon Advisory Group

October 25, 2018 6 p.m. – 8 p.m.

Region 6 office Montesano, WA

Staff: Chad Herring, Barbara McClellan, Lyle Jennings

Advisors: Jack Hollingsworth, Andy Mitby

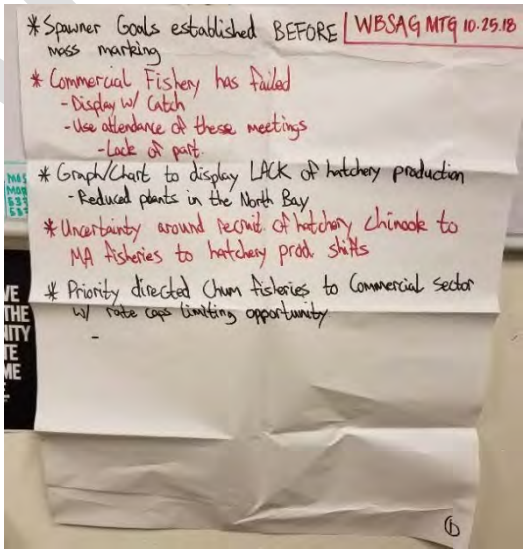
Public: 0 Individuals

Chad: Opening statements

- Task for next several presentations to Fish and Wildlife Commission (FWC) is to provide a comprehensive review of the performance of the policy through a data driven analysis for what was in the policy and what has happened in regard to what the policy wanted us to do.

Advisor Comments:

- The commercial sector shouldn't be labeled as participated in or part of the policy development in the upcoming Nov 2 FWC presentation on slide 3.
- Spawner goals established before mass marking
- FWC should see that the commercial fishery has failed since implementing the policy using catch
    - Display this with catch for the last several years
    - Use attendance of these meetings, lack of participation
- Highlight what next year will look like in terms of commercial and recreational fisheries in the north part of the bay due to reduced releases of Chinook from Forks Creek Hatchery – provide graph or chart of hatchery reduction
    - Graph/chart to display lack of hatchery production
    - Reduced plans in the north part of the bay
- Uncertainty around recruitment of hatchery Chinook to marine area fisheries to hatchery production shifts
- Priority for directed Chum fisheries to commercial sector with rate caps limiting opportunity



Willapa Bay Salmon Policy Review Advisory Workshop

November 17, 2018 (Saturday) 10 a.m. – 2 p.m.

Region 6 office Montesano, WA

Staff: Chad Herring, Barbara McClellan, Lyle Jennings, Chris Mattoon, Kirt Hughes

Advisors: Andy Mitby, Bob Lake, Jess Helsley, Marlisa Dugan, Tim Hamilton, Ross Barkhurst, Jack Hollingsworth, Lance Gray, Greg McMillan, Norm Reinhardt

Public: 5 Individuals

Chad: Opening statements

Randy Aho Presentation: Hatchery Production

- In 2008, established primary designation for Chinook: Naselle River
- In 2008, established primary designation for Coho: Willapa River and North River
- 2009 first year release with the new designation goals

Public Comments/Suggestions:

- Provide more historical data on hatchery releases
- Remove a considerable amount of silt from below the Nemah weir to provide enough water and space for fall Chinook – do a better job at providing a suitable environment
- Provide a better structure at Nemah weir
- Provide cooling system to the pond at Nemah
- Maintenance of the intake valve at Nemah
- Need to address river habitat situations to create deeper holes
- Ideas to help Nemah facility – tarp, ping pong balls, reflective cover

Lyle Jennings Presentation: Stock Assessment

- Public Comments/Suggestions:
  - Otolith marking and recovery to help with Coho NOS/HOS breakdown

Barbara McClellan Presentation: Marine Recreational Fishery and Commercial Fishery

- Public Comments/Suggestions:
  - Commercial be allowed to keep CWT hatchery Chinook when observers are onboard

Chad: Review of F&W Commission presentation in Vancouver on Nov.

- Will now be briefing with the Fish Committee for Dec and Jan instead of the full Commission
- No public comment at Fish Committee briefings
- For the final review, the agency has been tasked with providing 3-5 options to the Fish & Wildlife Commission for what to do regarding the WB Policy moving forward
- Hope to have those options refined with the advisory group by January

Public Comments/Suggestions:

- How much was lost in # fish or ex-vessel value from the commercial fishery prior to the policy in 2015 and after?

Chad: Quickly went through handouts for next meeting

Public Comment:

Diana Bone:

- Control Zone - Why isn't the ocean fishery taking some of those impacts?
- Genetics data

Dave Hamilton:

- Focusing on the wrong thing
- Assumption of the policy is that you can't stop the straying on the Naselle River
- There is no rationale for Willapa River having the primary designation

Ross Barkhurst

- Need to produce an upward trajectory

2019 Willapa Bay Salmon Advisory Group Policy Review Meeting

January 9, 2019 6 p.m. – 8 p.m.

Region 6 office Montesano, WA

Staff: Chad Herring, Kirt Hughes, Barbara McClellan

Advisors: Bob Lake, Marlisa Dugan, Steve Boerner, Ross Barkhurst, Jack Hollingsworth, Greg McMillan, Lance Gray, Tim Hamilton, Francis Estalilla, Jess Helsley

Public: 5 Individuals

Chad: Opening statements

Implementation:

Report Card (Stop Light) Handout –

This is an indicator of implementation, not an indicator of success

- Red = Not implemented
- Yellow = Mixed, on-going
- Green = Implemented

Advisor Comments/Suggestions:

- Out-migrant smolt traps below hatcheries in Naselle and Willapa
- Major milestone for restoration in the Willapa River
- Habitat issues have not been met. No inventory on eelgrass
- Impacts to non-local stocks in or out of the control zone
- Be clear to the Commission that this is an indicator of implementation not of success or if it worked
- Alternative gear wouldn't be fair to say it as is given that tangle nets are the only thing tried and it was before the policy
- Chinook impact rate should be changed to red since we missed it 2015-17
- We are straying away from biological principles for Chum
- It's important to stress what actually happened with Chinook relative to the impact rate – Should be red
- Stress where we are for the spawner escapement goal reviews
- Need to bring up the topic of designating a primary system in the entire coastal areas not just inside Willapa Bay
- Aggregate spawner goals should be red if we didn't make the goal
- Provide two set of columns or rows with boxes/colors for pre vs post season results
- In-season management actions should be red not green
- Freshwater habitat productivity – Should be red – fish ladder was closed almost the entire year so there is no access to habitat for wild steelhead and cutthroat.
- Add a legend to this handout because what these colors represent isn't clear

Performance:

Slide Handouts –

Advisor Comments/Suggestions:

- Add runsize slides
- Add a total column to slide 4 table for Chinook and Coho harvest
- New AHA run with the current data included
- Show/provide model to show impacts would be
- Commercial fishery should be able to harvest hatchery Chinook early to get them from ending up at the hatchery or the spawning grounds
- What is the spawning capacity for the Willapa systems for natural spawners?
- Reallocate impacts from ocean fisheries back to inside Willapa Bay
- Highlight what we have gained and learned with the increase of data collection

Herring Spawning

- Forage fish team in Olympia reinitiated in 2018 the data surveys/review in Willapa Bay
- Report is every four years

2018 Data

- Still preliminary, will have something for the late February meeting

Public Testimony

Allan Hollingsworth

- Timber companies are spraying and killing all of the fish
- The way the policy is written is putting the commercial fishery out of business
- Gravel on the Willapa River is moving. This is washing out the eggs.
- Chum on North River in Hatchery Creek has over 200 fish trying to spawn. You are missing some of the survey areas.
- Have mass hatchery production

Comprehensive Review of the Willapa Bay Salmon Management Policy C-3622 - Report Card

General Fisheries Management		
Prioritize restoration and conservation of wild salmon		Mixed, on-going
Work with partners to protect and restore habitat productivity		Mixed, on-going
Implement improved broodstock management		Mixed, pHOS not met in all areas
Investigate and promote the development and implementation of alternative selective gear		Mixed, only tangle nets tested
Work through the Pacific Salmon Commission to promote conservation objectives		Mixed, on-going
Monitoring, sampling and enforcement programs to account for species impacts		Yes, implemented
In-season management actions to meet conservation and management objectives		Yes, implemented
Transparency of salmon management and catch accounting		Yes, implemented
Improved fishery management and technical tools		Mixed, on-going
Promote mark-selective fisheries		Yes, implemented
Chinook Management		
Population designations - Willapa River; primary, Naselle River; contributing		Yes, implemented
20% impact rate on Willapa and Naselle River natural origin Chinook		Mixed, pre-season yes post-season no
Prioritize recreation fishing opportunities		Yes, implemented
Alternative gear set aside		Mixed, pre-season yes post-season no
Timing of commercial fisheries		Yes, implemented
Hatchery production		Mixed, not in all facilities
Coho Management		
Population designations		Yes, implemented
Achieve aggregate spawner goal		Mixed, pre-season yes post-season no
Prioritize commercial fishing opportunities		Yes, implemented
Chum Management		
Population designations		Yes, implemented
Achieve aggregate spawner goal		Mixed, pre-season yes post-season no
Prioritize commercial fishing opportunities		Yes, implemented
10% impact rate cap		Yes, implemented
Adaptive Management		
Conduct annual fishery management review		Yes
Improve in-season management		Mixed, on-going
Review spawner goals		No
Comprehensive hatchery assessment		Yes
Ocean ranching report		Yes

2019 Willapa Bay Salmon Advisory Group Policy Review Meeting

January 23, 2019 6 p.m. – 8 p.m.

Region 6 office Montesano, WA

Staff: Chad Herring, Barbara McClellan, Damon Peterson, Lyle Jennings

Advisors: Marlisa Dugan, Norm Reinhardt, Ross Barkhurst, Tim Hamilton, Greg McMillan, Lance Gray

Public: 4 Individuals

Chad: Opening statements, intros

Where are we?

- We will not be done with the comprehensive review by Feb. due to 2019 NOF, the detailed data requests from Fish Committee and lack of data for all years involved.
- Going to stop with this policy review process to go through NOF first then return to this review in May or June.
- In Feb, the agency will seek interim guidance from the FWC (Fish & Wildlife Commission) for 2019 fishery planning only.
- Feb Commission meeting tentative schedule has Grays Harbor 2018 review on Feb 9, 2019 at 9 am and Willapa at 10 am.

Fish Committee asked for:

1. Full description of where are we currently?

2. A better understanding and a full analysis of the 14% and assumptions from AHA

- Hatchery Reform policy is currently under review. The progress presentation will be on Friday, Feb. 8, 2019. The final presentation is due in September with the FWC taking action in either October or November. We will not know what the outcome will be until then for Hatchery Reform to help guide Willapa Bay.
- There is an Enhanced Fishery bills in the legislature to produce more fish statewide.
- Willapa has been identified where there is capacity to raise more fish for Southern Resident Killer Whales (SRKW). WA coastal Chinook stocks rank high for prey availability for SRKW.
- Need to have a discussion regarding Spring Chinook in Willapa Bay. Currently about 670,000 were transferred to Forks Creek Hatchery from Kalama. They were in poor condition. Release will be around May 2019 (brood year is 2018). Most will return as 4-year olds (so return in spring 2022).
    - Species-specific guidance of Spring Chinook in Willapa probably needs to be added to the interim guidance for 2019 or WB Salmon Mgmt policy.
    - We will not be collecting broodstock in Willapa Bay.
- Larry Carpenter is now Chair of the FWC and Barbara Baker is Vice Chair
- 2019 will be the first year for returns of the lowered release of Chinook from Forks Creek Hatchery.

- About 75% of the landed catch by the marine recreational fishery using coded wire tags is from Forks Creek Hatchery.

Advisor comments:

- Need to look at the bigger picture relative to habitat and bay carrying capacity or productivity. These issues need to be included in any presentation. Will more fish help or hurt the bay?
- Need another eel grass survey within WB to see if it's in decline or not
- We are spending time arguing over the last fish. Why can't we just turn this fishery into a terminal fishery for harvest and maximize the hatchery production?
- For Willapa Bay, we have a huge problem getting hatchery fish off the spawning beds with our current production. We do not have the techniques or the infrastructure to remove them.
- We need to make some hard decisions that we don't want to make.
- This policy was set up to fail for the sport and commercial fisheries. The next four years will be difficult not just this coming year.
- The policy will never work on the budget the Dept. currently has, the equipment or infrastructure currently in place.
- Production success is based on production and the ability to collect them when they return.
- Water quality issues – dredging and aerators for Nemah

Public Testimony:

Ron Schweitzer:

- Don't understand who will get all of these additional Chinook?

LeeRoy Wisner:

- Need to get rid of HSRG. There no wild fish. Raise hatchery fish.
- The Dept needs to tell the Commission we need to do something else.

Art Holman:

- There are no fish. The cause is the ocean fishery.

Paul Qualey

- Would support moving the hatchery fish back to Forks Creek Hatchery
- Seems like we are working hard to preserve a fish that is small in the big picture.

Willapa Bay Salmon Advisory Group Meeting

August 14, 2019 6 pm – 8 pm

Raymond Elks Lodge, Raymond, WA

Topic: Willapa Bay Salmon Policy (C-3622) Comprehensive Review Update

Staff: Chad Herring, Barbara McClellan, Damon Peterson

Advisors: Marlisa Dugan, Ross Barkhurst, Jack Hollingsworth, Bob Lake, Mara Zimmerman, Steve Boerner, Tim Hamilton, Norm Reinhardt, Andy Mitby, Francis Estalilla

Public: 11 Individuals

- Opening statements/Introductions
- Update on addition of Mara Zimmerman and removal of Jess Helsley due to change in jobs (handout of contact information)
- Comprehensive Review Timeline (handout)
    - How do we move forward to collect advisory group comments in Sept and Oct?
        - Options: Mid-week, Saturday, conference call –send out doodle poll
- Staff Presentation on the Comp Review Analysis to-date, which is to answer the question does reducing fishing pressure on Chinook in Willapa Bay result in a measurable conservation benefit.
    - Willapa Bay experienced a 48.9% reduction in harvest but only a 4.97% increase in wild spawner escapement and 17% in hatchery escapement.

Advisor Comments:

- The agency did not consider in this analysis all of the preseason or in-season modifications to the policy
- Want to see the output of AHA if we didn't have the policy, AHA with the policy now if followed as written, and what AHA would show with the policy but with the modifications that were made to the policy
- This analysis is the recreational and commercial together. Want those analyzed separately
- The result of not seeing additional Chinook in natural-origin escapement might be due to what this harbor can hold, a carrying capacity issue.
- Low flow water issues and disease could be a cause for a low increase in escapement
- After being caught, the fish are more susceptible to stress and mortality
- This analysis is incomplete. It omits externalities such as compliance with the policy, habitat removal, eelgrass spraying, herring spawning biomass, first time we have reached escapement in Willapa River, and reached pHOS in Naselle River.
- Pre-spawn mortalities would be a factor to account for the 10K fish not accounted for. i.e. carcass recovery is low for Chinook
- Add a disclaimer that members of the advisory group do not agree with this analysis
- Fish and Wildlife Commissioners will likely have a lack of comprehension of this report
- Don't see the variables parsed out and captured fully in this analysis so not sure the Commissioners, who will make a final decision, will understand

- We did not take the initial recommendation of going to 14%. If we did, what would the response be and what would the data show then?
- Want to see the next four-year time step without the number of variables as the first time step did.
- Add an addendum summarizing the advisor comments regardless of validity for the Commissioners to see
- Did they take in all the mitigating factors in this analysis?
- What are the other questions and analyses going to be?
    - Did the policy increase the quality of the marine and freshwater recreational fisheries?
- Four years of data is not enough for this analysis. Tell that to the Commission. The 14% needs to be implemented in the next few years.
- Want it noted that the commercial fishery is where most of the reductions were taken
- The commercial fishery was reduced in the Humptulips fishery.
- Highlight the statement on the PowerPoint on the last slide regarding not finding a pattern does not mean there is not a pattern.
- An advisor has been turned down twice about commenting prior to speaking to the Commission
- We are exceeding MSY. Show what the decline in productivity at the hatcheries (smaller fish with less eggs that results in a need for more fish)
- Pre-spawning mortalities due to disease needs to be included in conclusions
- What happened to the commercial fishery and the amount of money lost needs to be added as well as the loss of revenue to Pacific County

<u>Public comments:</u>

Clark Cottrell:

- One of the policy goals listed is to achieve restoration of wild salmon. Even though that's an admirable, that seems to be at the cost of hatchery salmon
- Would like to see as a policy goal to increase the harvest

Allan Hollingsworth:

- Seals are a problem in the bay that harvest a good amount of salmon
- Runsize was overestimated preseason. That is the reason the escapement did not show the increase.

Mark Hermes:

- Supports getting rid of this policy
- Maximize hatchery production
- Support commercial fishing in August and September but not November. Leave those November late coho for the recreational fishery

Brent Soule:

- A lot of bickering
- More work needs to be done with user groups
- More work needs to be done with predators

Dale Beasley:

- President of Columbia River crab association

- Policy decisions have changed more than anything else has. The people are being left out of fisheries management.
- People want more harvest
- Things need to change
- Need more hatchery production

Tim Hamilton

- Recognize who the audience is in the presentations given
- Do not point the finger at the advisors when talking with the Commission

Art Holman:

- The agency has ruined the sport fishery
- Sport fishery no longer has priority

Ross Barkhurst:

- The analysis was well done within its parameters, but it does not adequately address everything that needs to be addressed. By not addressing those additional things, the analysis can be misleading.
- The impression that you get is that all these sacrifices were made but since the wild fish did not get anything out of it, we should dump the policy.
- I have a way to determine the difference between the wild fish experience in the bay vs the freshwater.
- Advisory process has deteriorated
- Region 6 staff is isolated from the recreational and commercial fishers

Marlisa Dugan:

- The analysis is incomplete to bring in broader ramifications of things that created the smaller than expected wild fish escapement to the gravel.
- Recommend looking at more years, 4 – 8 years, with the lower 14% impact rate

Bob Lake:

- Snagging for eggs is a concern.
- Enforcement needs to stand up
- Needs to shut down the freshwater systems where fish are spawning to protect them.

Willapa Bay Comprehensive Review of Policy C-3622: Process and Schedule			
Type	**Purpose**	**Date**	**Status**
Public workshop	Public feedback on policy	January 23, 2018	Completed
WBSAG	Proposed process, review public feedback	September 14, 2018	Completed
WBSAG - recreational	Data workshop	October 24, 2018	Completed
WBSAG - commercial	Data workshop	October 25, 2018	Completed
FWC	Proposed process, commissioner feedback	November 2, 2018	Completed
WBSAG	Review of relevant data	Nov/Dec 2018	Completed
FWC - Fish Committee	Briefing on possbile review report structure	December 13, 2018	Completed
FWC	Policy guidance on comprehensive review content, and process and schedule for completion	April 1, 2019	Completed
FWC - Fish Committee	Review draft table of contents for comprehensive review; further review of proposed process and schedule	June 13, 2019	Completed
WBSAG	Feedback on comprehensive review structure and content	August 14, 2019	Proposed
WBSAG	Feedback on comprehensive review structure and content	Sept. TBD, 2019	Proposed
WBSAG	Review of draft final comprehensive review document and consideration of a range of alternatives for policy adjustments	October TBD, 2019	Proposed
FWC - Fish Committee	Briefing on draft final comprehensive review document and a preliminary range of alternatives for policy adjustments	Oct. 17, 2019	Proposed
FWC	Approval of comprehensive review final report and a range of alternatives for policy adjustments to be analyzed by staff	Oct. 18-19, 2019	Proposed
WBSAG	Analysis of range of alternatives for policy adjustments	Nov. 3, 2019 (tentative)	Proposed
WBSAG	Consider recommendations for policy adjustments	Jan. 6, 2020 (tentative)	Proposed
FWC - Fish Committee	Briefing on analysis on the range of alternatives for policy adjustments and any recommendations	Jan. 9, 2020 (tentative)	Proposed
FWC	Consider analysis on the range of alternatives for policy adjustments and select a preliminary preferred alternative for public review	Jan. 10-11, 2020. (tentative)	Proposed
WBSAG	Consider preliminary preferred alternative out for public review	Jan. 24, 2020 (tentative)	Proposed
FWC - Fish Committee	Briefing on further analysis of possible policy adjustments and advisory body/public input; consider recommendation to full Commission	Feb. 13, 2020 (tentative)	Proposed
FWC	Final decision on policy revisions, if any	Feb. 14-15, 2020 (tentative)	Proposed

Willapa Bay Salmon Advisory Group Meeting

September 18, 2019 6 pm – 8 pm

Region 6 Office, Montesano, WA

Staff: Chad Herring, Ron Warren, Kirt Hughes, Barbara McClellan, Lyle Jennings

Advisors: Jack Hollingsworth, Steve Boerner, Lance Gray, Greg McMillan, Tim Hamilton, Francis Estalilla, Mara Zimmerman, Norm Reinhardt, Ross Barkhurst, Bob Lake

Andy Mitby (conference phone line)

Public: 13 Individuals

Chad Herring:

- Last week's meeting review and summary
- How do we, as a group, decide what additional topics this group discusses?
- We can schedule another day, maybe a whole day, to discuss some of these other topics. We can bring other staff in who may be experts on these other topics.
- Longer meetings?
    - Advisor comments:
        - Choose items that relate directly to the comprehensive review of the policy
        - Concentrate on raising fish
        - Do what we were instructed to do for the comprehensive review – advisors give opinions of review rather than establishing the topics
        - Issues to attend meeting for commercial advisors given there is an on-going fishery.
        - Can you pair it down to a few items rather than the entire list? stick to the point
        - Let's work on the comments the Fish and Wildlife Commission (FWC) provided to this group relative to the comprehensive review
- Comprehensive Review Process and Schedule
    - Original date for commission review was October but that has now been extended to the December Commission meeting
    - This group is providing recommendations to the Director. You are free to send in your comments to the FWC via written or in person. Staff will write up the document and this group will provide comments on what the draft document.
    - Tentative WBSAG meetings: October 24 and November 21
    - Do we need more meetings or longer meetings in order to accomplish this review?
    - Advisor comments:
        - Advisor wants to know about the process and what and when things will be provided
        - Advisor feels this is a big hill to climb given how contentious this policy has been. It is hard to see this group going through 36 questions provided by the FWC in the next few months. It seems like more time for each meeting in order to accomplish this.

        - Prioritize topics
        - Most of the questions have to do with data. Most of the issues will come from any policy changes
- Comprehensive Review Table of Contents (TOC)
    - In this document, the questions from the FWC are identified by each item listed
    - Advisor Question: how difficult would it be to change the primary status?
        - That could be part of the advisor recommendations
    - Advisor Comments:
        - 5.7 Stock recruit analysis – want to see total numbers prior to pre-terminal and terminal interceptions. There seems to be false sense of recruitment.
        - Add this previous comment regarding interceptions at 4.1
        - Need a recalculation for the timeframe
        - You appear to be looking at coho and chum stock recruit analysis differently than chinook. Why?
        - Request: Chinook Annex numbers in most recent agreement
        - Fishery encounter rate data doesn't seem to work out and compare to spawning ground survey data
    - Until we have a more robust assessment of spawning ground surveys, we won't know what we truly need for escapement
    - Advisor: Ocean pre-terminal interceptions. Need to advocate against that.
    - Advisor: The ocean fisheries always seem to get the increases in quota first.
    - Advisor: What number are we chasing regarding the spawner goal? This is the underlying question in the policy. The commercial fishery ex-vessel value that was used to create the policy has disappeared.
    - Advisor: Include the ex-vessel value information into the executive summary
    - Advisor: Believe you can only do is a general review regarding ex-vessel value or recreational economics not anything in-depth
    - Advisor: Has contact with someone at UW regarding economics
    - Commercial economics from the 1980s and 1990s
- Hatchery Production - handout
    - South Resident Killer Whale Issue (SRKW)
        - Agency given funds to increase some production to provide for SRKW
        - Proposals for 2019 shared with co-managers around the state
        - Future brood draft process has started for Willapa Bay
        - Proposed increases for Willapa Bay
            - Naselle Fall Chinook – additional 2.5 million – total would be 5 million beginning with 2019 brood year
            - Forks Creek Fall Chinook – additional 50,000 – total would be 400,000 – funds available to look at hatchery practices to put studies in place. At Forks, a mating release study is being considered because there is a long-term dataset regarding coded wire tags.
            - Grays Harbor production increase are NOT in agreement with co-managers
            - Forks Creek Coho – additional 300,00

- Nemah Hatchery Chum – additional 1 million
- Naselle Hatchery – new rebuild is supposed to be done by spring of 2023 and this will help eliminate pHOS issues once these increase adults return
- These increases have been vetted through HSRG
- Advisor Comments:
    - Where are these eggs coming from or going to in Naselle Hatchery for Chinook? Recreational fishery in freshwater has taken so many females
    - Forks Creek status? Construction there
    - Any talk regarding releasing more spring chinook than 2018?
        - Ron Warren: Eggs are from Columbia, but not enough eggs may be available. No eggs will be brought to Willapa for 2019 brood year.
    - This increase eliminates the recreational fishery in the marine area
    - Don't see how we do anything at Forks Creek as long as the policy is as written, and Willapa River is the primary
    - The entire marine recreational fishery is dependent on Forks Creek production. Cannot move the recreational to the south end, which is also contrary to the policy. Having Willapa River as the primary was a mistake. It needs to be moved back to Naselle especially when the new infrastructure is in place. Need to increase Forks Creek production.
    - We shouldn't have the primary system identified within Willapa. The primary should be designated within the entire ESU. By switching it to Naselle, it hampers the commercial fishery.
    - These increases is a slap in the face to the recreational fishers.
    - If we are afraid that someone else will catch our fish with production increases, then we should stop production. Need to talk about how production increases will benefit everyone. What number are we chasing? The number hasn't really changed much over time.
    - What kind of total production can this harbor support? Need to spread the opportunity around. Forks Creek production does not provide a meaningful recreational fishery.

Ron Warren:

- All of these issues are difficult. Compliments the group for tonight's discussion. The discussion tonight was respectful.

Public comment:

Dave Hamilton:

- These questions were some of the best review of a policy that he's seen. He clearly defines what he is looking for. His questions are focused and pointed. The challenge will be when the math comes out differently and from a different point of view.
- The proposal for increased production at Naselle Hatchery is ridiculous. Need to consider other issues. What will you do on low water issues, fish health issues?
- The increase in Naselle Hatchery is destined to fail. It is not a viable proposal.
- Need hatchery staff to answer questions regarding these hatchery production increases. They can help work through issues in Willapa hatcheries.
- You advisors do not need to tow the agency line.

Jason Lake:

- Need to get the primary out of Willapa Bay.
- Need to get eggs from the Nemah Hatchery.

Ron Warren:

- Not going to say that is a good number for hatchery production
- We were told to raise fish, 24 million addition fish, because of SRKW.

Advisor asked the public in the room if he should advocate to change the primary designation in Willapa Bay. All but one public individual raised their hand in agreement that he should advocate for the change.

Willapa Bay Salmon Advisory Group Meeting
October 24, 2019 6 pm - 8 pm
Raymond Elks Lodge, Raymond, WA

Staff: Chad Herring, James Losee, Barbara McClellan, Lyle Jennings, Jenny Allan Advisors: Marlisa Dugan, Tim Hamilton, Ross Barkhurst, Lance Gray, Bob Lake, Norm

Reinhardt, Mara Zimmerman, Francis Estalilla (via phone), Andy Mitby (via phone)

Public: 13 Individuals

Jenny Allan:

- Opening statements about meeting
- Walks through ground rules that were chosen at previous meeting o
  - Agree to 3-minute comments
  - o Ground rules will apply to the public that attend meeting (not advisors) as well
  - o Advisor topics for agenda

Chad Herring:

- Ground rules are important to be productive in order to have advisor input for agenda and stay on topic
- Agenda - suggests saving some time at the end of the meeting to discuss other topics of importance and advisors provide feedback
  - o Possible topic for tonight for Chinook eggtake
  - o #11 on handout - Public can comment on any topic (not just the agenda). They will comment first, and all of the advisors will stay for those comments. Then the advisors can comment afterwards.

Advisor #1 - feels as though we have already hashed this out at a previous meeting

Advisor #2 - doesn't care for it. Thought we were supposed to be reviewing the policy.

Need to stop wasting time. Advisors shouldn't be allowed to comment on record at the end of the meeting. Advisors have had their chance to comment. At the end of the meeting should be left for just the public.

Advisor #3 - agree that we have gone over this already. We don't have enough time in two hours. We need 5 - 8 pm or 6- 9 pm.

Advisor #4 - Everyone needs a break every hour. Need a ground rule that we will not routinely exclude the 4 H's in our policy discussion. Public should be allowed to comment on any topic.

Advisor #5 - takes offense to #6 on the handout (Flip Chart Notes from Ground Rules Discussion Sept 10, 2019 meeting). This is being portrayed as our problem. It was not. The leadership that ran these meetings has the problem. Public has the right to talk about anything they want relative to #11 on the handout

Advisor #6 - an agenda item has been suggested and that came from the Fish Committee.

The agenda items should be predetermined based on their importance base on what the Fish and Wildlife Commission needs to decide on this policy. Why aren't we focusing on how to build a better fishery?

Advisor #7 - Would like to see my time spent on reviewing the policy. Likes the round robin. Providing agenda items in advance is helpful so that I have a chance to think about them prior to the meeting.

Chad Herring - we are going back over the rules because things weren't working within this group. We need some certainty in how we operate. We are trying to put together something, so we all know what is expected and everyone has a say in how we move forward over time.

Discussion:

- Egg take discussion (20 minutes) - Barbara McClellan walked through eggtake handout provided
  - What is the plan for extra Chinook eggs from Forks Creek Hatchery?
  - This body does not make decisions. This body provides input to WDFW.
  - Future Brood Document (FBD) is our agency guiding document. In FBD, it has been identified that extra eggs are used to backfill Nemah Hatchery.
  - For Naselle, we are trying to make 5 million eggs off of an 800,000 brood year. It was always a tough goal to reach 5 million this year. We still have more fish to come over the next several weeks at Naselle and Forks Creek. Nemah will not make program. It is difficult to keep these Chinook alive at Nemah. Nemah has requirements through the Clean Water Act with affluent discharge to the river using formalin. It's also about the structure of the adult pond.
  - Some rec advisors sent a letter to allow those additional eggs to be released from Forks Creek Hatchery rather than move them to another facility so that it would help the recreational marine fishery.
  - A decision has yet to be made regarding these additional eggs from Forks Creek Hatchery.
  - Smolt to Adult Return (SARs) for Chinook from Forks Creek Hatchery is about 0.5 % and 0.4% from Naselle Hatchery
  - Advisor - We are constantly changing what we do and don't manage for eggtake or the fishery. You are a manager for a policy not the fishery. Have no issues with adding more fish at the north end of the bay but how will you harvest them? Can't manage from a piece of paper.
  - Advisor - these additional eggs should be split at Forks and Naselle. Spring Chinook eggs are available at Marble Mount.
    - It is not approved to bring eggs from Puget Sound relative to spring Chinook.
  - Advisor - what is the level of mortality assumed from egg to release? 10%
  - Advisor - In-season management is supposed to be divided equally and shared by salt and freshwater
  - Advisor - want to talk about solutions? 2019 is a disaster for Chinook egg take. In-season management was not utilized. We are not getting enough fish back to sustain our own

production. There should not have been any commercial fishery on Chinook prior to Sept. 16.

- Advisor - should have shut the rivers down for Chinook retention. Need to get the policy where it benefits everyone. Need to stop the snagging females for eggs in the river.
- Advisor - We keep losing fish at Nemah. The rebuild at Naselle hopefully should make the return and survivability better.
- Advisor - except for egg take there is nothing wrong with putting out fish from Nemah
- We are currently in this pattern of low flows and warm water in September and October now. We need to be adaptable to these issues.
- Advisor - Formalin was not used every day that he was there. Commercial fishers were violating the rules fishing bank to bank and set netting.
- Advisor - What is the return rate for the Nemah?
  - The problem is that we use coded wire tags and we have not had a return of coded wire tags since 2006 brood. The older data suggests that it's about 0.3% but we now have tags starting in 2016.

  There has been a lack of funding for the Nemah Hatchery. There is not enough depth on the gravel bar below the weir. A minor change needs to be made so that Chinook will volunteer into the pond.

<u>Advisor Input for what to do with the additional egg take at Forks Creek Hatchery:</u>

Advisor #1: Backfill to both Naselle and Nemah hatcheries

Advisor #2: Split the additional eggs 60% and backfill to Naselle and 40% stay in Forks Creek. Take all the eggs in Nemah Hatchery and split those 60% to Naselle and 40% to Forks. Do not release any Chinook from Nemah Hatchery.

Advisor #3: Agree with Advisor #2.

Advisor #4: Figure out where the best return is and use them there.

Advisor #5: Split additional eggs above 400K evenly between all three facilities Advisor #6: Half should stay in Forks Creek and half should go to the Nemah Hatchery

Advisor #7: Backfill to Nemah and get all three hatcheries to stand on their own. Get 2.5 million first Forks Creek first then move the additional above 2.5 million to Nemah hatchery.

Advisor #8: Leave them all at Forks Creek hatchery - Whatever we get at each facility, release from that facility without backfilling.

Advisor #9: Agree with #8 by releasing what each facility gets. Moving more eggs to Nemah without dealing with the mortality issues, would not be wise. Don't kill the run but need to deal with the mortality issue first.

- Comp review process (10 minutes)
  - We have collected a lot of data. It is going to take a while to analyze data.
  - The hatchery reform policy (HSRG) is currently being reviewed as well. Do not know when that will be presented to the FWC.
  - Possible final product of summer 2020

- How do we prioritize resources to get all of the workcompleted given staffing and time issues?
- The guidance for 2020 NOF has yet to be determined
- It's more important to have a quality product that has been vetted through technical review
- Weekly Update - Did not get to thistopic

Public Comment:

Ezra McCampbell

- Used to fish with tribes
- Raymond has been out of compliance with wastewater. Need to follow environmental laws.
- Herbicides and pesticides kill juvenile salmon
- Clear cutting results in silt to move
- Need to get everyone to work together

Harvest Mccampbell

- If we can't close the fisheries when the returns are low, then we won't have fisheries at all
- There are lots of environmental laws broken and nothing seems to be regulated or enforced. This needs to be fixed.
- The meeting notices need to be here in Pacific County not Grays Harbor County.

Lisa Olson

- Coming to educate herself
- Hope that the recommendation to the Commission is to get rid of the policy. Money is being lost in revenue locally, but sales tax is going up for the County.
- There is a way to have revenue for everyone if we just work together.

Karen Carter

- Prior to three years ago, salmon were everywhere. Since then there is an obvious decline in salmon returns.
- Why is the program goal for Chinook lower at Forks Creek hatchery than the other two facilities?

Marlisa Dugan

- Preterminal interceptions took too many
- Willapa commercial fishery should not have been allowed to fish with such a low run using in-season management

Bob Lake

- Part of the lower end of the bay was removed from the commercial fishery
- Chum was also taken away from the commercial fishery

- Need Chum fisheries in the third and fourth weeks of October

Ross Barkhurst

- Don't kill the only rec priority we have
- In-season manage what we have

Mark Miller

- Issues with predators (seals) in the river now. Cormorants as well.
- Need to take care of these predator issues too.
- If the hatchery isn't getting fish, then cut the season.
- Need to pump rivers full of fish.
- Why no plants of steelhead in the SF Willapa since 2012?

Last topic: Do we want to keep the Nov 21st meeting? Let's think about it.

Possible Agenda:

- History of Chinook transfers
- Disease and problem solving (regional pathologists?)