Willapa Bay Management Plan

October 18, 2010

Washington Department of FISH and WILDLIFE

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Executive Summary

TO BE EXPANDED LATER

The Willapa Bay Management Plan documents our two primary objectives:

1. Maintain and rebuild the health of salmon and steelhead populations in the Willapa Bay region.
2. Provide sustainable fisheries for both recreational and commercial interests in Willapa Bay and its associated watersheds.

Full Implementation of the Willapa Bay Management Plan will:

- Increase fitness and productivity of naturally spawning populations.
- Stabilize hatchery production that will reduce impacts to wild populations, while supporting sustainable sport and commercial fisheries.
- Create hatchery programs that are consistent with or exceed hatchery reform standards and associated Washington Fish and Wildlife Commission policies.
- Production levels will support sustainable sport and commercial fisheries, including increased levels of selective fisheries

Introduction

Advisory Group Acknowledgements

In early 2008, the Washington Department of Fish and Wildlife (WDFW) solicited stakeholders to participate on an advisory group to represent recreational, commercial, and conservation interests in the development of a Willapa Bay Management Plan. A large number of stakeholders expressed interest in being involved in the process ultimately twelve people were appointed by Director Philip Anderson. The WDFW is greatly appreciative of the time commitment, participation and contributions made by these twelve representatives: Diana Bone, Ron Craig, Francis Estalilla, Lance Gray, Steve Gray, Alan Hollingsworth, Mike Johnson, Bob Lake, Andy Mitby, Ron Nanney, Norm Reinhardt, and LeeRoy Wisner. Participation by these appointees was highly valued and greatly appreciated by the WDFW.

Purpose of Plan

This document provides the foundation for management of salmon, steelhead, and sturgeon populations within Willapa Bay and its associated freshwater areas. Identified and addressed in this plan are the regulatory, administrative and other directives applicable to and considered by the WDFW for management of fishery resources in the Willapa Bay Region. Key among these are the enabling

legislation designating the WDFW as the regulatory agency responsible for managing fishery resources in the State of Washington, applicable Fish and Wildlife Commission policies, and the sound scientific principals in which are the foundation for the 21st Century Salmon and Steelhead Initiative. There are also management actions and other factors which influence the health of salmon, steelhead, and sturgeon populations utilizing Willapa Bay that this plan cannot affect and may not address. However, some limited discussion of fisheries affecting Willapa Bay salmon stocks and sturgeon management is included.

Plan Development Process

In 1999, WDFW met with key constituents of the Willapa Bay commercial and recreational fisheries to develop a framework fishery management plan for salmon and sturgeon in Willapa Bay (http://wdfw.wa.gov/fish/regs/commregs/2002framework.htm). The 1999 framework included interim goals focused on achieving sustainable recreational and commercial fishing opportunities while providing ecological benefits from both natural and hatchery salmon populations in the basin. That framework document was annually updated to reflect discussions that were held with fishers during each year's preseason planning process and to help lay the foundation for a more comprehensive long-term plan for Willapa Bay. This document is the culmination of efforts by the WDFW in consultation with the Advisory Group to revise the content and structure of the 1999 and subsequent Willapa Bay Management Frameworks.

The process to develop this revised plan began in 2008 when WDFW hosted two introductory meetings and solicited stakeholders to participate on an advisory group. The Willapa Bay Advisory Group was formed by WDFW Director appointment of interested stakeholders representing commercial, recreational, and conservation interests. Our first meeting was on May 22, 2008, and we continued to meet regularly through the following two-year to develop this plan. These meetings provided a platform for understanding of Willapa Bay's fishery resources, fishery science and management objectives that is consistent with the WDFW's mission, goals, policies, and the 21st Century Salmon and Steelhead Initiative. This Plan will guide development of annual fishery management plans, working through the North of Falcon process. Objectives represented in this plan provide the framework to implement actions necessary to achieve the goals described in the WDFW 21st Century Salmon and Steelhead Initiative relative to wild fish populations and fisheries in the Willapa Bay region.

First and foremost, conservation was identified as not only the highest priority but as an investment in the future of fishery resources and the welfare of commercial and sport constituents. The approach that has been developed is one that directs us to consider management of the ecosystem, in an all "H" context, by balancing the needs of fish resources with the needs of those who utilize and rely upon those resources. To accomplish this, hatchery operations and harvest decisions must be consistent with the principals described in the hatchery and harvest reform policy. A critical element for successful long-term management is our ability to plan and verify our actions. These actions as well as the objectives we strive to achieve must be regularly evaluated. This adaptive management approach will allow for continued research, monitoring and scientific evaluation to refresh information required for decisions making purposes.

Legislative Mandate, Mission, and Applicable Goals, Policies and Initiatives

There are numerous Legislative mandates that guide the WDFW. From these mandates we have developed our mission, as well as relevant policy guidance and key Agency initiatives regarding fishery resources, harvest, and hatchery production as they relate to the Willapa Bay region.

WDFW's overarching Legislative mandate (RCW 77.04.012) is "… to preserve, protect, perpetuate, and manage the wildlife and food fish, game fish, and shellfish in state waters and offshore waters." In so doing, "… the department shall conserve the wildlife and food fish, game fish, and shellfish resources in a manner that does not impair the resource. Consistent with this mandate, the department shall seek to maintain the economic well-being and stability of the fishing industry in the state. The department shall promote orderly fisheries and shall enhance and improve recreational and commercial fishing in this state."

It is the mission of the WDFW to serve Washington's citizens by protecting, restoring and enhancing fish and wildlife and their habitats, while providing sustainable fish and wildlife-related recreational and commercial opportunities.

To achieve its mission, the WDFW will continue to focus its activities on the following goals:

- Achieve healthy, diverse and sustainable fish and wildlife populations.
- Ensure sustainable fish and wildlife opportunities for social and economic benefit.
- Ensure effective use of current and future financial resources in order to meet the needs of the state's fish and wildlife resource for the benefit of the public.
- Implement processes that produce sound and professional decisions, cultivate public involvement and build public confidence and agency credibility.
- Promote development and responsible use of sound, objective science to inform decision-making.

In November 2009, the Washington Fish and Wildlife Commission implemented Policy number C-3619 - Hatchery and Harvest Reform (see appendix 1.). This policy directs the WDFW staff to promote the conservation and recovery of wild salmon and steelhead, provide fishery-related benefits by establishing clear goals for each state hatchery, conduct scientifically defensible operations, and use informed decision making to improve management. Accordingly WDFW will designate all artificial production programs as either Conservation Programs or Harvest Programs. Conservation Programs, those implemented with a conservation objective, shall have a net aggregate benefit for the diversity, spatial structure, productivity, and abundance of the target wild population. Harvest Programs, those implemented to enhance harvest opportunities, shall provide fishery benefits while allowing watershed-specific goals for the diversity, spatial structure, productivity, and abundance of wild populations to be met. This policy also provides direction for the implementation of hatchery reform in the context of "all-H integration" and in alignment with the principals, standards and recommendations of the Hatchery Scientific Review Group (HSRG). In the area of harvest reform, the policy calls for an increased focus on the harvest of abundant hatchery fish through mark-selective salmon and steelhead fisheries. It also specifically directs staff to develop, promote and implement alternative fishing gear to maximize catch of hatchery-origin fish with minimal mortality to native salmon and steelhead, unless the wild

populations substantially affected by the fishery are meeting spawner and broodstock management objectives. It is in that context where the Department may consider other management approaches provided they are as or more effective than a mark selective fishery in achieving spawner and broodstock management objectives.

The Washington Department of Fish and Wildlife developed the 21st Century Salmon and Steelhead Initiative (21CSS or "the Initiative") to meet its responsibilities in recovering salmon and steelhead and provide sustainable fisheries. This resulted in an integrated management framework designed to:

- Restore federally listed populations through six salmon recovery plans.
- Create and maintain selective and sustainable fisheries.
- Protect and restore habitat.
- Retool hatchery operations to support wild fish recovery.
- Further state-tribal co-management.
- Develop new strategic partnerships.

As presented in the Initiative, the WDFW shall manage salmon and steelhead to recovery and sustainability in a way that is science-based, well-documented, transparent, well-communicated, and accountable. In order to successfully accomplish this, there are six areas of key results within which specific actions and activities are organized: Wild Fish Populations, Habitat, Fisheries/Harvest, Co-management, Internal Alignment and External Support. Of these Key Result Areas there are three with specific application to the management of the Willapa Bay watershed that will be discussed in more detail within this Plan: Wild Fish Populations, Fisheries/Harvest, and Habitat. The objectives of these Key Result Areas are:

Wild Fish Populations - All fish populations contribute to the conservation of Washington's salmon and steelhead resource and functioning ecosystems and core populations are healthy, stable, and self-sustaining.

Fisheries/Harvest - Fisheries are managed to meet or exceed ESA, recovery, and conservation goals; and harvest management measures protect and promote the long-term well-being of the commercial and recreational fisheries.

Habitat - The habitat characteristics and ecosystem functions necessary for salmonid survival and recovery are protected and restored. This is with the understanding that people are part of the landscape. Work with volunteer organizations where appropriate to maintain current condition, reduces risk of threatened destruction or modification negatively impacting habitat throughout the region.

Management, Conservation and Natural Production Objectives

New fundamentals for the management of hatchery production, natural spawning populations, and fisheries have recently been developed in the face of declining abundance of salmon population throughout the Pacific Northwest and the listing of species under the Endangered Species Act. Two scientifically based groups, Technical Recovery Teams (TRT's) and the Hatchery Scientific Review

Group (HSRG), were established. These groups have developed a variety of scientifically defensible tools and principles to support policy makers, managers, and citizens at large with planning recovery actions for listed salmonids. Although there are no listed species in Willapa Bay these tools and principle are applicable on natural stock management. In the development of this plan WDFW staff have used these tools and further refined their specific application for Willapa Bay hatchery programs to meet both conservation and harvest goals.

In 2000, the U.S. Congress established the Puget Sound and Coastal Washington Hatchery Reform Project. Led by independent scientists and supported by state, tribal, federal and private sector leaders, the project was intended to provide a science-based reform of our hatchery system to achieve two goals:

1. helping to conserve naturally spawning salmon and steelhead populations and,
2. supporting sustainable fisheries.

The HSRG developed a suite of hatchery management tools to support application of these principles, including a scientific framework for artificial propagation of salmon and steelhead (HSRG 2004)[1]. This framework includes benefit/risk assessments tools; hatchery operational guidelines; monitoring and evaluation criteria; and others. The primary analytical tool is the "All H Analyzer" (AHA), a Microsoft Excel-based application that allows managers to explore potential outcomes of alternative strategies of balancing hatcheries, harvest, habitat and hydroelectric system constraints.

The HSRG concluded that in order for hatcheries to contribute to harvest on a sustainable basis, they must be operated in a manner that is compatible with conservation goals for salmon and steelhead resources at both the local and regional levels. This implies that hatcheries must be managed consistent with basic biological principles and viewed as integral components of the affected ecosystem. Key among the biological principals identified by HSRG is genetic management; where hatchery broodstocks need to be managed as either genetically segregated from or integrated with natural populations. Standards provided by the HSRG to guide genetic management are specific to the program type and define the level of hatchery influence on natural populations.

Proportionate Natural Influence (PNI) is a measure of the relative contributions of hatchery origin fish spawning in the wild (pHOS) with Natural origin fish (pNOS) to those fish used in the hatchery broodstock of both hatchery origin (pHOB) and natural origin (pNOB). For populations to achieve PNI goals managers must balance the proportion of natural origin recruits (pNOB) used in hatchery broodstock while maintaining sufficient natural origin spawners on the spawning ground (pNOS). Successful management of broodstock will move populations toward our overall PNI goals, which will promote rebuilding and recovery of natural populations in areas where habitat is protected and restored to support these populations. For natural populations, stocks of high importance will need to achieve a minimum PNI value of 0.67. Stocks of slightly less importance to the overall viability will need reach a PNI of at least 0.50. Stocks that remain must at least maintain the current level of PNI.

[1] Hatchery Scientific Review Group (HSRG)–Lars Mobrand (chair), John Barr, Lee Blankenship, Don Campton, Trevor Evelyn, Tom Flagg, Conrad Mahnken, Robert Piper, Paul Seidel, Lisa Seeb and Bill Smoker. April 2004. Hatchery Reform: Principles and Recommendations of the HSRG. Long Live the Kings, 1305 Fourth Avenue, Suite 810, Seattle, WA 98101

Stock Designations

Designating the level of importance for each natural stock is critical in attaining our overarching conservation goal of long-term sustainability. To accomplish this, one approach we must consider is in terms of viability. In the context of ESA, stocks restored or maintained would be expected to have "high" or "high +" viability. Stocks of low to medium significance and viability can be expected to contribute to recovery. *Stabilizing* stocks are those that would be maintained at current levels viability which may be low. As noted these categorizations are provided for in the context of ESA and further utilized in the development of recovery plans. NOAA – Fisheries created geographically based Technical Recovery Teams (TRTs) to assist in developing recovery plans for these species. These multi-disciplinary science teams were tasked with providing scientific support to recovery planners by developing biologically based viability criteria, analyzing alternative recovery strategies, and providing scientific review of draft plans. The various TRT's all developed similar viability criteria, for Willapa Bay we have chosen the lower Columbia River model.

One critical element of the TRT's recommendations is that not every population needs to be managed to achieve the same goal. Goals are structured to allow management in sub-basins where moderate to high quality habitat provide for cost effective results in an effort to obtain self-sustaining highly viable populations. Substantial improvements are not required in some sub-basins, although criteria require additional protection and restoration efforts to prevent further declines. These principals result in population being designated as: *Primary*, *Contributing*, and *Stabilizing*. Aligning these population designations with the criteria developed by the HSRG; *Primary* Populations are those of high importance, where the goal will be to achieve a minimum PNI value of 0.67. *Contributing* Populations are those of slightly less importance to the overall viability of the population, with a minimum PNI of 0.50. *Stabilizing* Populations are those which remain and which the goal will be to at least maintain the current level of PNI (table 1).

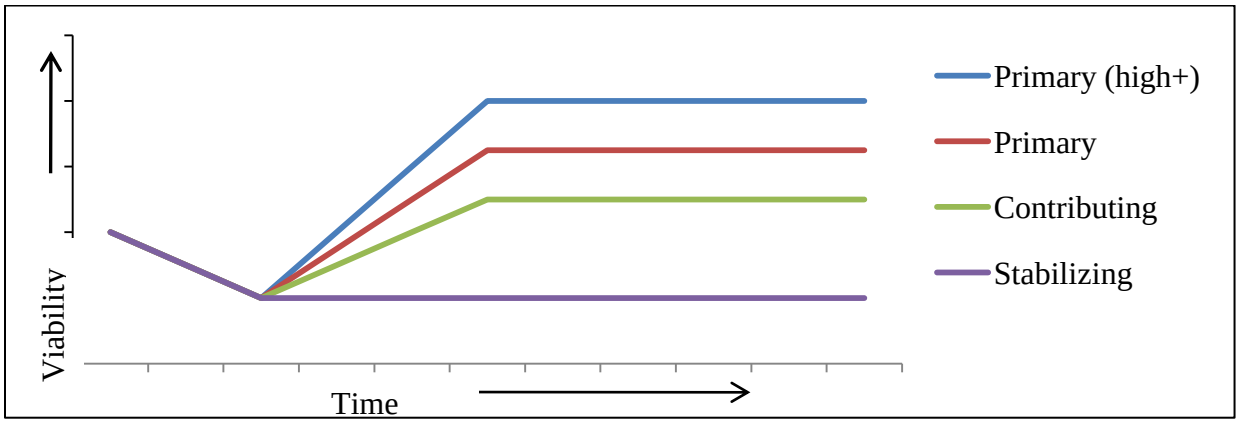


Figure 1. Schematic diagram of population designations relative to viability based on abundance through time.

Using this approach we developed a plan that combines fall Chinook populations on the South Washington Coast that share both biological (genetic) and ecological (EPA eco-zone) similarities with each other. Generally speaking the Willapa Bay region is considered to fall within what we have identified as the South Washington Coast fall Chinook strata. This strata (sub-population), or MPG (major population group), is part of the larger WA coast Chinook ESU.

Table 1. Broodstock management criteria for Proportionate Natural Influence (PNI), proportion hatchery-origin spawners (pHOS), or rate of gene flow[2] (GF) for each category of natural population that has associated hatchery programs.

Affected Natural Population Type	Broodstock Management Strategy	
	Integrated	Segregated
Primary	PNI > 0.67	pHOS < 0.05; GF < 0.02
Contributing	PNI > 0.50	pHOS < 0.10; GF < 0.04
Stabilizing	PNI ≥ current	pHOS and GF ≤ current

These regionally unique characteristics were used to develop an approach that spread the conservation planning over both the Willapa Bay and Grays Harbor watersheds. This meant that at least one *Primary* Population could be designated in the Willapa Bay watershed and a second will be identified in the Grays Harbor watershed. Remaining populations in both areas would then be designated as *Contributing* or *Stabilizing*. Figure 1 graphically represents how population viability changes through time from current to a new point of equilibrium when management measures based on the criteria in Table 2 have influenced a population's viability. In the process of identifying the extent of the strata within which the Willapa watersheds would be included, the group initially considered treating Willapa Bay as a single unique stratum. This approach would have required two *Primary* populations within a stratum where only three Chinook populations are identified in the Salmon and Steelhead Inventory (SaSI). In light of this and in consideration of the similarities in geomorphology between Willapa Bay and the Grays Harbor watershed to the north the "South Washington Coast" stratum was expanded to include Grays Harbor. In so doing, the South Washington Coast strata is similar in scope to the Lower Columbia as identified in the Lower Columbia River recovery plan. The requisite two *Primary* populations in the strata are spatially distributed among Willapa Bay and Grays Harbor watershed.

There are several metrics used to evaluate the abundance, productivity, diversity, and spatial structure of salmon population, collectively these are referred to as viable salmonid population (VSP) parameters. For Chinook there are two populations, associated with hatchery production, to consider for *Primary*; the Naselle River and Willapa River. These are the largest and most productive Chinook populations in the Willapa Bay watershed and have the greatest potential for natural sustainability. For Coho, North River/Smith Creek is largest, most productive population, with very little hatchery influence. The availability of known spawning habitat, capacity for growth and geographic location relative to other

[2] Gene flow is the rate at which genetic material flows from one population, population component or group of populations to another (see Scott and Gill (2006) for the mathematical formulation of gene flow). Gene flow is a more appropriate criterion than pHOS where a substantial difference exists between the spawn-timing of the hatchery and natural populations (e.g., hatchery programs operated with early-timed broodstock like Chambers or Skamania).

populations and hatchery programs, led to the WDFW finalization of designations for each population of each species (table 3). Metrics to evaluate management in this context include PNI, pNOB and pHOS.

With the exception of the North River/Smith Creek, the current PNI values for Chinook and coho are well below the minimum goal for stocks important to population conservation (table 1 and 5). This is a result of high proportions of hatchery fish spawning in the wild and low proportion of natural-origin fish taken in for hatchery brood stock.

Spawner Escapement Goals

Single point escapement goals tend to be the primary management tool of natural spawning populations. With ESA listings occurring throughout the northwest, more refined methods have and are being developed to allow fishery managers to more discreetly manage individual populations to meet recovery objectives while offering fishing opportunities in mixed stock areas. In some locations, escapement goals were based on available habitat for adult spawning and juvenile rearing. In many populations, initial goals were determined by averaging observed escapement for a series of years (usually the three highest years observed during the 1970s). For a few stocks, managers attempted to develop goals based on "maximum sustained yield" (MSY), which is, theoretically, the largest yield/catch that can be taken from a species stock over an indefinite period.

In the case of Willapa Bay, single point numeric goals have been developed for each species and each watershed where spawning exists. More recently, managers have begun to utilize additional measures of population assessment to evaluate the health and strength of spawning populations.

As a result, this section of the plan will focus on the conservation objectives more specifically associated with Chinook, coho, chum and steelhead. Current escapement goals for these species within the Willapa Bay watershed are: Chinook, 4,350; coho, 13,090; chum, 35,400; and steelhead, 10,000 (tables 2, 5, 7 and 9).

Fisheries Management

Fundamental to fisheries management in Washington is involvement in the PFMC and North of Falcon processes. The annual series of PFMC and North of Falcon meetings is the foundation for the development of all fishing in Washington including the Pacific Ocean, Columbia River, Strait of Juan de Fuca, Puget Sound, inland rivers, and coastal harbors and rivers. There are, however, more northern fisheries occurring in the coastal waters of Canada and Alaska, which substantively impact Chinook and coho originating from Willapa Bay. Agreements for these fisheries are governed through the Pacific Salmon Treaty where overall harvest limits on Washington stocks are negotiated. These fisheries in Canada and Alaska have historically accounted for 67% of total Willapa Bay Chinook harvested (figure 2). When coupled with terminal harvest rates that exceeded 70%, the overall harvest or total exploitation rate of Willapa Bay origin Chinook was near 90%.

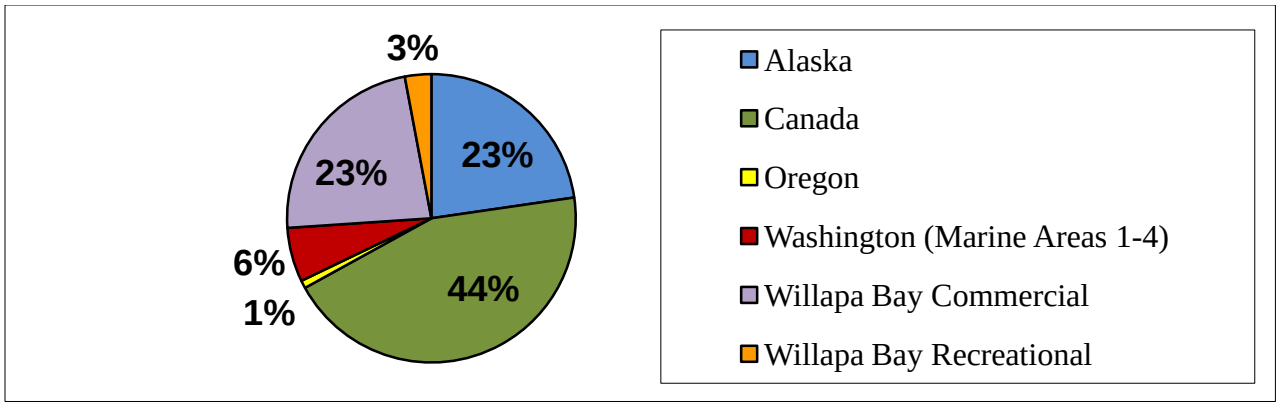


Figure 2. Fishery Recoveries of Chinook coded wire tag (CWT) groups released from Willapa Bay Hatcheries 1971-73, 1982-87, 1995-99.

Pacific Fishery Management Council

The Pacific Fishery Management Council (the Pacific Council) is one of eight regional fishery management councils established by the Magnuson Fishery Conservation and Management Act of 1976 for the purpose of managing fisheries 3-200 miles offshore of the United States of America coastline. The Pacific Council is responsible for fisheries off the coasts of California, Oregon, and Washington. Pacific coast salmon fisheries in Council-managed waters focus on Chinook and coho. Annually the Pacific Council follows a preseason process to develop recommendations for management of the ocean fisheries. Public meetings where managers develop ocean fishing options occurs in March. Public hearings on these options are held in late-March or early-April, and the final recommendations are adopted at a Council meeting in April.

North of Falcon Process

WDFW fisheries managers are particularly involved with the North of Cape Falcon process, governing the harvest regime from Cape Falcon, Oregon (just south of the Columbia River) north to the U.S.-Canada border. Since the ocean fisheries forums set the context for all fishing that follows in Washington coastal harbors and streams, Columbia River, the Strait of Juan de Fuca, and Puget Sound, annual fishing regimes for most salmon populations are negotiated within this forum. The annual series of PFMC and North of Falcon meetings receive active participation from state and tribal co-managers as well as individual commercial and recreational fishing groups and charter operators. Representatives from environmental organizations, local governments, and others involved in salmon recovery are also encouraged to participate. Willapa Bay fisheries will continue to be developed on an annual basis through the North of Falcon process using the best information available to estimate projected run sizes, fishery impacts (both outside and inside waters), and escapements. Emphasis on escapement goals for both natural and hatchery stocks will continue and future management goals will include.

Chinook Management

Population Objectives and Designations

Chinook fisheries will continue to be based on preseason forecasts. Managers will maximize harvest opportunity on hatchery fish in a manner that is consistent with achieving objectives and goals for healthy, diverse and sustainable natural spawning population identified in Table 2. For Chinook programs this will mainly be accomplished by shifting the location of large harvest augmentation programs away from the Chinook population in the Naselle River, which has been designated as a *Primary Population*. The current 30% pre-season terminal harvest ceiling management will be maintained as the pre-season management objective for the Naselle Chinook population. Other Chinook stocks will be managed to allow for higher harvest rates while achieving natural and hatchery escapement goals. The WDFW will evaluate management success through fisheries and spawning.

The Chinook escapement goal for all Willapa Bay tributaries of 4,353 has historically represented the benchmark of achieving the spawner escapement goal. As a result of high harvest rates both in Willapa Bay and in outside fisheries, environmental factors and hatchery influences; this escapement goal for natural origin Chinook has not been regularly achieved (figure 3). In an effort to address issues within the scope of this plan the WDFW will manage Willapa Bay Chinook to achieve stock specific escapement goals in conjunction with viability goals for each stock identified in table 2. These goals are designed to fully seed available spawning habitat while managing gene-flow between natural and hatchery population in a way that increases the overall viability of Willapa Bay Chinook.

Future evaluation of natural spawning success will assess individual river systems and their associated stocks within the Willapa Bay Region for whether or not they are achieving their system specific goals as identified in Table 2. For *Primary* and *Contributing* populations this assessment will evaluate the total number of spawners and the composition on spawning ground in terms of natural or hatchery origin. The proportion of hatchery origin spawners (pHOS) should not exceed 30% in rivers where hatchery production is integrated with the wild stock. The Naselle and North rivers are designated as *Primary* and *Contributing* respectively and will be managed to achieve this 30% pHOS standard. The Nemah Hatchery program is fundamentally segregated from wild production by the absence of a historic Chinook population. The proportion of hatchery origin spawners in the Nemah should not exceed 5% of the total spawners. For the Willapa River, which managers have designated as a *Stabilizing* population, the proportion of hatchery origin spawners should not exceed current levels.

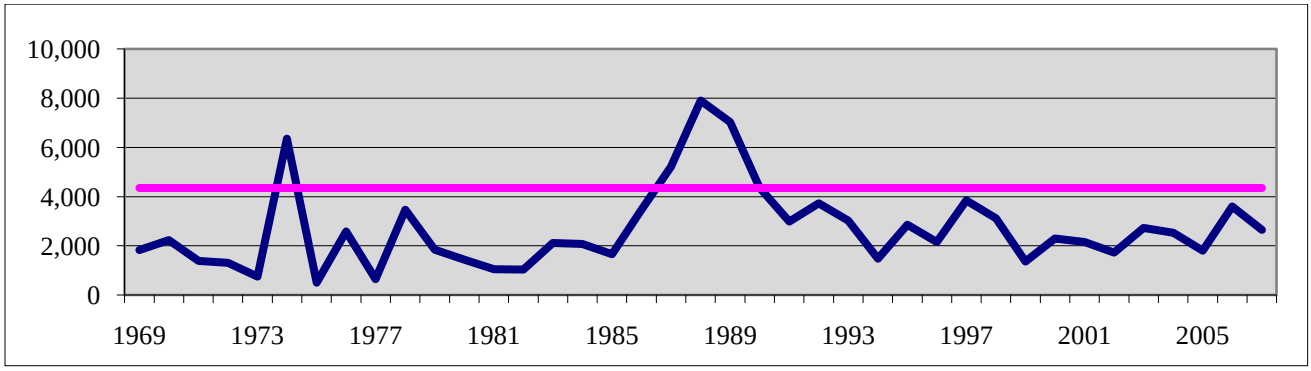


Figure 3. Willapa Bay Chinook, Natural Spawning Escapement

Table 2. Watershed/Population specific goals for escapement, viability and hatchery broodstock management of Willapa Bay Chinook.

Watershed/ Population	Escapement goal	Viability Goal	Associated Hatchery Program?	Current PNI – estimated	Broodstock Strategy and metrics
North River/ Smith Creek	991	*Contributing*	No	1.0	No Program
Willapa River	1,181	*Stabilizing*	Yes	0.07	Integrated; PNI > current, pHOS < current
Palix River	104	*Stabilizing*	No	1.0	No Program
Nemah River	224	Not applicable	Yes	Not applicable	Segregated; pHOS (strays) < 0.05
Naselle River	1,547	*Primary*	Yes	0.04	Integrated; PNI > 0.67, pHOS<0.30
Bear River	306	*Stabilizing*	No	1.0	No Program

Hatchery Production

Represented in Table 3 is "current" production – 2009 level – at each WDFW hatchery in Willapa Bay. The amount of production identified in each of the proposed alternatives including the final plan allows the WDFW to achieve PNI and pHOS goals identified in table 2 with modifications to fisheries. Although substantial changes in production are needed to achieve PNI, pHOS goals the total production at the three Willapa Bay hatcheries, in aggregate, remains unchanged.

Integrated Chinook programs at Forks Creek and Naselle hatcheries will be monitored for contribution to fisheries and broodstock both on the spawning grounds and at the hatcheries through the coded wire tag (CWT) program. Annual tagging of Forks Creek Chinook for the purpose of representing south coastal Washington Chinook as an indicator stock for fishery interception will continue. Naselle Hatchery Chinook will be CWT'd, at a minimum, every other year for the purpose of evaluating the total terminal harvest impact both Naselle hatchery and natural production are experiencing.

Table 3. Artificial Production of Chinook at Willapa Bay Hatcheries.

Hatchery	Current	Original Proposal	Option 1	Option 2	Final
Forks Creek	2,200,000	377,000	2,000,000	377,000	3,200,000
Nemah	2,000,000	3,000,000	4,000,000	4,000,000	3,300,000
Naselle	3,000,000	364,000	380,000	3,000,000	500,000

Fishery Management

Management period for Chinook is August 16th – September 9th annually.

In an effort to reverse the tendency for not achieving escapement the WDFW implemented a new management regime for Willapa Bay Chinook. Beginning in 2003 the terminal exploitation rate was limited to roughly 30% through the pre-season fishery planning process. For 2003-2008, the average pre-season terminal exploitation rate based on pre-season planning models has been 30.3% and the resulting average post-season rate has been 35.1%.

Since 2003, commercial fisheries in Willapa Bay have had no salmon directed openings prior to September. Fisheries have focused on harvesting abundant hatchery origin coho within limits associated with a terminal exploitation rate management ceiling of 30% for Chinook.

Table 4. Pre- and Post-season Terminal Exploitation Rates for Willapa Bay Chinook, 2003 - 2008.

Year	Pre-Season	Post-Season
2003	29.7%	38.2%
2004	29.4%	25.5%
2005	30.1%	39.3%*
2006	30.5%	40.0%*
2007	31.3%	33.3%*
2008	30.6%	34.5%*
2009	29.9%	Na

*Based on incomplete total run reconstruction resulting from draft sport harvest estimate for 2005 – 2008.

There are many reasons for the difference of roughly 5%. A portion of this variance may be accounted for in the ability of the model used to predict the terminal abundance of Chinook, coho and chum returning to Willapa Bay (Appendix 4). These models have historically performed reasonably well as indicators of expected abundance, but require additional refinement to improve the successful application of these models as a tool for managers. Fishery planning models, on the other hand, have been reliable indicators of expected harvest, particularly when fisheries and participation are consistent with past practices. Pre-season planning models are based on average harvest rates that have occurred in Willapa Bay fisheries.

The WDFW will continue to utilize a 30% terminal exploitation rate management strategy for *Primary* Chinook populations within the Willapa Bay portion of the Southwest Washington strata, specifically the Naselle River population. Strategic use on these impacts will be critical to maximizing overall harvest of hatchery Chinook and coho production. Continued monitoring of fishery impacts will be important and the use of coded-wire tags applied to a representative group of un-marked Naselle Hatchery releases will play a key role. Through this strategy, it is anticipated that other populations within Willapa Bay will be, at a minimum, maintained at their current levels of viability and abundance or increased.

To further reduce Chinook impacts during coho management periods, certain areas have been closed and/or commercial fishers have utilized unstrung gillnets with a maximum 6-inch stretched mesh and a maximum net depth of 55 meshes. These methods of time, area, and gear selectivity will soon be expanded to offer additional opportunities for selective harvest of mass marked (adipose fin clipped) hatchery Chinook. It is estimated that nearly 90% of Willapa Bay hatchery Chinook releases intended for harvest will be mass marked during the 2010 return year and essentially 100% by return year 2012. These selective harvest techniques will improve the ability to access abundant hatchery Chinook resulting in fewer hatchery origin Chinook straying to spawn in the wild with naturally produced fish. Coupled with modifications to hatchery production and the application of population viability-based conservation objectives, the overall viability of natural spawning populations will increase.

Selective harvest techniques have been utilized in the past and will continue to aid managers in achieving conservation objectives for Chinook. Future fisheries using selective methods and alternative gears to improve survival of non-target species and stocks will begin the testing phase in 2014. Consistent with this timeframe adult returns will reflect nearly 100% of the programmatic changes to hatchery production implemented in the 2009 brood year. Additionally, Chinook production at Naselle Hatchery will provide managers with the ability to fully assess harvest rates in terminal fisheries with the implementation of a biennial coded wire tagging program.

Recreational Fisheries

The recreational salmon fishing schedule within marine waters of Willapa Bay has been relatively consistent for several years. Annual openings in Marine Area 2.1 (MA 2.1) have occurred within the late-June to early-July timeframe, continuing through January of the following year. Marine Area 2 retention regulations are applied to MA 2.1 through August 15 annually. Beginning August 16 MA 2.1 operates under its own set of regulations until the bay is closed at the end of January. Typically this has been a six fish limit with two to three adults in the daily bag depending upon annual runsize forecasts. Harvest in the recreational fishery is predominantly Chinook salmon.

Freshwater recreational salmon fisheries have opened in August for the Naselle River, Middle and South Forks Nemah River, and the lower section of the Willapa River. September openings occur for the smaller tributaries including Bear, Niawiakum, Palix and North rivers. October openings occur in the North Fork Nemah and the upper section of Willapa River. The daily limit for all systems has been six fish, two to three adults, and varying restrictions on the number of adult Chinook allowed depending upon the predicted run strength. In some years Chinook non-retention is required beginning in some or all freshwater areas.

As geographic distribution and relative abundance shifts in response to changes in hatchery production the pattern of freshwater fishing regulations described above will need to be evaluated and modified as necessary to achieve management objectives. Similarly recreational fisheries will need to shift to mark selective fishing resulting from the prevalence of marked Chinook in MA 2.1 and in freshwater areas associated with the large harvest programs in the Willapa and Nemah rivers. To improve survival of adult salmon being released in mark selective fisheries single point barbless hooks requirements will be imposed when unmarked adult release requirements are in place.

Commercial Fisheries

The commercial fishing schedule will be set during the North of Falcon process, based on the preseason forecasts for that year. It is anticipated that future fisheries will not include "Dip-in" fisheries. The dip-in fisheries, which were historically a regular component of the commercial fishing regime for Willapa Bay, targeted abundant Columbia River Chinook stocks, many of which are now listed under ESA. In 2002 and 2003, DNA samples were collected in Willapa Bay during the July through early-August timeframe when this fishery historically occurred (Kassler and Marshall 2004). This work identified that, while there are ESA listed Columbia River Chinook stocks in the catch, a large component of the harvest included local origin Willapa Bay and Grays Harbor Chinook.

In-season updates based on run-size adjustments and a process to revise regulations in-season have not been utilized since 2002. However in-season adjustments extending the commercial season due to unfishable days caused by inclement and un-safe weather have been made. With the significant shift in hatchery production described earlier in this plan, it is anticipated that fishing schedules established during the North of Falcon process will be adhered to throughout the season without in-season updates. This precautionary approach will provide for some amount of relative predictability in season structure and duration. However, this will not preclude in-season changes based on sampling information. Willapa Bay commercial fisheries will be sampled for biological data to inform management models and monitored in-season. If sampling detects significant deviations from pre-season expectations, schedule adjustments for conservation purposes may occur. Additionally, as noted above, adjustments may be made in response to conditions where the fishery is unable to operate as scheduled (e.g., if severe inclement weather forces fishermen off the water for safety reasons).

Test fisheries will be utilized to evaluate the ability of commercial fisheries to harvest abundant hatchery Chinook returning to the northern portions of Willapa Bay while minimizing the impact on the Naselle River Chinook stock. Annually this will be included in pre-season planning through the North of Falcon process and will be consistent with achieving conservations goals identified in table 2 and without exceeding the 30% harvest rate ceiling on Naselle River Chinook.

WDFW will continue to implement fisheries that do not disproportionately harvest fish from one segment of the return. This may result in fisheries which are one or two days in duration versus the more consistent multiple-day or "straight through" schedule of the past few years.

WDFW will also evaluate time, area, and gear modifications in addition to mark-selective fisheries in order to increase to total harvest of hatchery Chinook in an effort to achieve conservations goals.

Coho Management

Population Objectives and Designations

Coho fisheries will continue to be based on preseason forecasts. Managers will maximize harvest opportunity on hatchery fish, in a manner that is consistent with achieving objectives and goals for healthy, diverse and sustainable natural spawning population identified in table 5. For coho programs this will mainly be accomplished by shifting the location of large harvest augmentation programs away from the coho stocks in the North and Willapa rivers, which have been designated as *Primary* populations.

For coho, balancing natural and hatchery production in the rivers will mostly be accomplished with broodstock management strategies – removing excess hatchery fish before they reach spawning grounds through fisheries and by more effectively recruiting natural origin fish to the hatchery for use in the hatchery broodstock.

The natural spawning goal (in aggregate) for Willapa Bay coho is 13,090. Natural escapement has generally exceeded the system wide goal. Future evaluation of natural spawning success will assess individual rivers within the Willapa Bay Region for whether or not they are achieving their system specific goals as identified in Table 5. For *Primary* and *Contributing* populations this assessment will evaluate the total number of spawners and the composition in terms of natural or hatchery origin. The proportion of hatchery origin spawners should not exceed 30% in rivers where hatchery production is integrated with wild stock. Where the hatchery program is intended to be segregated from wild production the proportion of hatchery origin spawners should not exceed 5% of the total spawners. For the Naselle River, which managers have designated as a *Stabilizing* population the proportion of hatchery origin spawners should not exceed current levels.

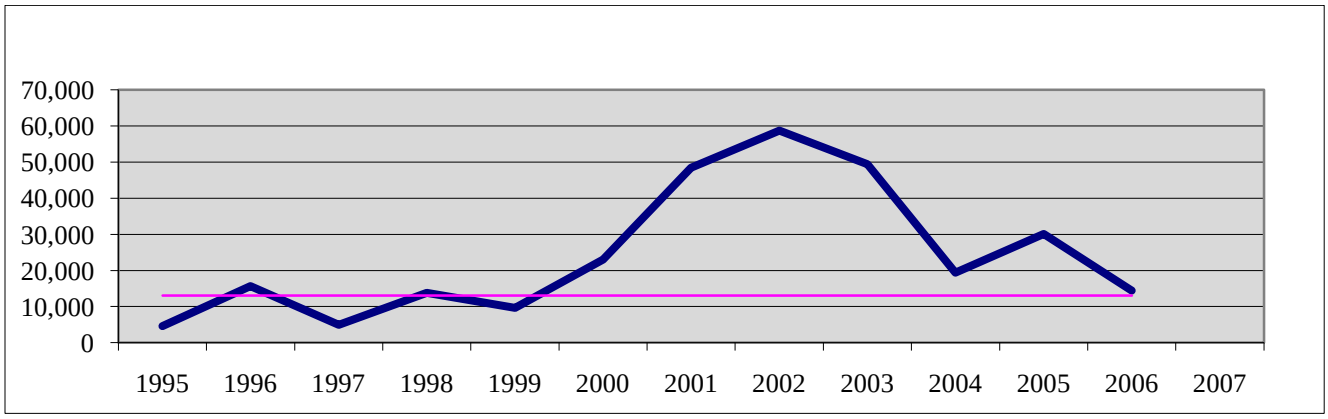


Figure 4. Willapa Bay Coho, Natural Spawning Escapement

Table 5. Watershed/Population specific goals for escapement, viability and hatchery broodstock management of Willapa Bay Coho.

Watershed/ Population	Escapement Goal	Viability Goal	Associated Hatchery Program?	Current PNI - estimated	Broodstock Strategy and metrics
North River/ Smith Creek	5,286	*Primary*	No	1.0	No Program
Willapa River	4,030	*Primary*	Yes	0.03	Integrated; PNI > 0.67, pHOS < 0.30
Palix River	251	*Contributing*	No	1.0	No Programs
Nemah River	994	*Contributing*	No	0.02	No program
Naselle River	2,091	*Stabilizing*	Yes	0.03	Integrated; PNI > current pHOS < current
Bear River	438	*Contributing*	No	1.0	No Programs

Hatchery Management

Represented in Table 6 is "current" production – 2009 level – at each WDFW hatchery in Willapa Bay The amount of production identified in each of the proposed alternatives including the final plan allows PNI and pHOS goals identified in Table 5 to be achieved.

Table 6. Artificial Production of Coho at Willapa Bay Hatcheries

Hatchery	Current	Original Proposal	Option 1	Option 2	Final
Forks Creek	600,000	730,000	600,000	730,000	300,000
Nemah	500,000	285,000	0	0	0
Naselle	600,000	1,000,000	1,000,000	500,000	1,400,000

Fishery Management

Management period for coho is September 10th – October 15th annually.

Since 2003, commercial fisheries in Willapa Bay have focused on harvesting abundant hatchery origin coho while meeting or exceeding escapement goals for natural coho and within the constraints of allowable impacts on other species. During coho management, area and gillnet restrictions have also been used to further increase efficiencies in harvesting coho while reducing harvest of Chinook. Specifically unstrung gillnets with a maximum 6-inch stretched mesh and a maximum net depth of 55 meshes have been used to reduce the harvest of Chinook. These methods of time, area, and gear selectivity will continue to be refined to offer additional opportunities for selective harvest hatchery origin coho.

Hatchery coho in Willapa Bay in essentially 100% mass marked and has been since the late 1990's.

Recreational Fisheries

Recreational fishing opportunity for coho in MA 2.1 is described in detail in the Recreational Fishers section of Chinook management. Essentially, MA 2.1 is open for coho harvest July 1st through January 31st annually. However, this schedule and specific requirements may vary annually depending upon pre-season estimates of ocean or local abundance. The majority of recreational fishing effort in marine waters of Willapa Bay – MA 2.1 – is directed towards the harvest of Chinook, while coho tend to be harvested incidentally.

Freshwater recreational salmon fishing opens in August for Naselle, Middle and South Forks Nemah, and the lower section of the Willapa River. September openings occur for the smaller tributaries including Bear, Niawiakum, Palix and North rivers. October openings occur in the North Fork Nemah and the upper section of Willapa River. The daily limit for freshwater areas open to salmon fishing has historically been six fish, with two to three adults allowed in the daily bag limit. Depending upon the run strength, available hatchery fish for harvest and escapement history wild coho retention has been restricted in some systems. This general pattern is expected to continue in the short-term. As geographic distribution and relative abundance shifts in response to changes in hatchery production, the pattern of freshwater fishing regulations described above will need to be evaluated and modified as necessary to achieve management objectives.

Commercial Fisheries

The commercial fishing schedule will be set during the North of Falcon process, based on the preseason forecasts for that year. With the significant shift in hatchery production described earlier in this plan, it is anticipated that fishing schedules established during the North of Falcon process will be adhered to throughout the season without in-season updates. This precautionary approach will provide for some amount of relative predictability in season structure and duration. However, this will not preclude in-season changes based on sampling information. Willapa Bay commercial fisheries will be sampled for biological data to inform management models and monitored in-season. If sampling detects significant

deviations from pre-season expectations, schedule adjustments for conservation purposes may occur. Additionally, as noted above, adjustment may be made in response to conditions where the fishery is unable to operate as scheduled (e.g., if severe inclement weather forces fishermen off the water for safety reasons).

Test fisheries will be utilized to evaluate the ability of commercial fisheries to harvest abundant hatchery coho returning to the southern portions of Willapa Bay while minimizing the impact on the Naselle River Chinook stock. Additional test fishing would be conducted to evaluate the applicability of directing harvest on hatchery coho returning from Forks Creek Hatchery releases which are of lower abundance than Naselle Hatchery coho releases. This work would evaluate the amount of harvest pressure natural production destine for North River/Smith Creek and the Willapa River could experience and still achieve the productivity and viability goals for these *Primary* populations. Annually pre-season planning through the North of Falcon process would include provisions for these activities.

WDFW will continue to implement fisheries that do not disproportionately harvest fish from one segment if the return. This may result in fisheries which are one or two day in duration versus the more consistent multiple-day or "straight through" schedule of the past few years.

WDFW will also evaluate time, area, and gear modifications in addition to mark-selective fisheries in order to increase to total harvest of hatchery Chinook in an effort to achieve conservations goals.

Chum Management

Population Objectives and Designations

Estimates of chum salmon escapement in Willapa Bay began in 1968. River system specific viability goals and conservation objectives for natural spawning chum have not been developed. For harvest management purposes the system-wide escapement goal is 35,400; individual river specific goals are listed in Table 7. This goal was established in the late 1980's during which time average escapement was 35,420, which represented full seeding of the available habitat. When historic escapements are measured against the escapement goal it is clear that the system is not being fully seeded on an annual basis. Large returns during the 1980s are partially due to the returns of large hatchery releases. Since the discontinuation of hatchery chum production at the end of the 1980's spawner escapement has only exceed the goal five times.

In consideration of the tendency for chum salmon falling short of achieving the established escapement goal implementation of an eight year moratorium on directed chum fisheries beginning with the 2009 return year. This action was allow for the abundance and distribution of chum to rebuild and to aid in reestablishing historic composition of natural production, thereby helping to achieve and maintain healthy natural populations of chum. In addition to this action WDFW is committed to supporting efforts by organized volunteer groups who desire to bolster the rebuilding of Willapa Bay chum through hatchery supplementation. WDFW will actively spawn, rear and release chum at Willapa Bay hatcheries to supplement natural production as identified in table 8 below and generate a source of eggs for volunteer groups. Organized volunteers groups interested in chum supplementation are encouraged to develop project proposals and work with WDFW fish management staff to initiate these types of projects.

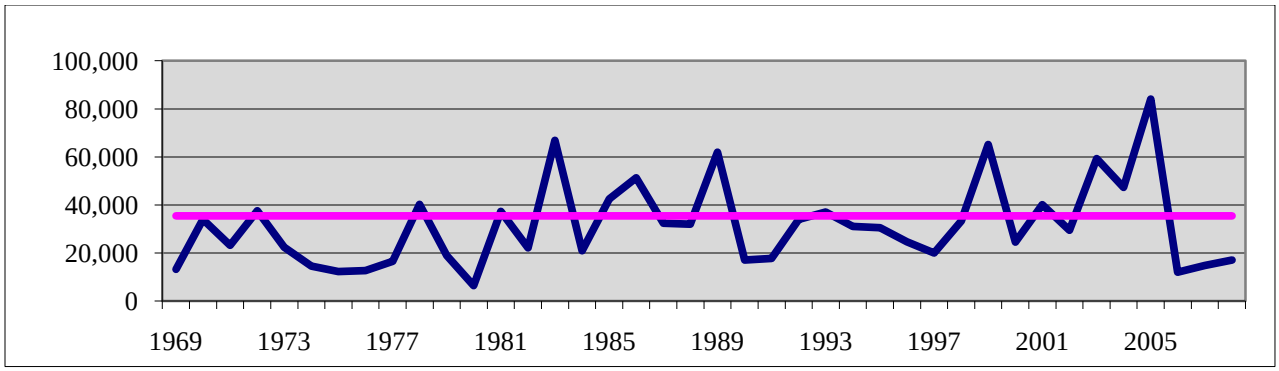


Figure 5. Willapa Bay Chum, Natural Spawning Escapement

Table 7. Watershed/Population specific goals for escapement of Willapa Bay Chum.

Watershed	Natural Chum
North River/ Smith	5,152
Willapa River	2,028
Palix River	3,460
Nemah River	6,266
Naselle River	3,232
Bear River	13,638

Hatchery Management

As indicated above WDFW will actively spawn, rear and release chum at Willapa Bay hatcheries to supplement natural production as identified in Table 8 below and generate a source of eggs for volunteer groups. Table 8 captures the desire to reinitiate small scale supplementation activities for chum. As proposals from volunteer groups are received they will be evaluated to ensure that all programs are consistent with these standards.

Table 8. – Artificial Production of Chum at Willapa Bay Hatcheries.

Hatchery	Current	Original Proposal	Final
Forks Creek	0	300,000*	300,000*
Nemah	0	300,000*	300,000*
Naselle	0	300,000*	300,000*

* Up to 300K for on-station release in the short term; these egg takes would come from adult returns to facilities and volunteer group collection efforts. Egg takes in excess of 300K could be used by volunteer groups via RSI for release in basin of original adult collection.

Fishery Management

Management period for chum is October 16th – October 31st annually.

Through the 2017 fall fishery there will be no directed harvest of chum salmon throughout the marine waters of Willapa Bay and its freshwater tributaries. In the 2018 pre-season planning process the WDFW will provide a recommendation to interested stakeholder regarding the resumption of directed chum fisheries or an extension of the eight year moratorium on directed harvest initiated in fall 2009. In the interim, incidental harvest impacts resulting from fisheries directed at salmon species other chum and white sturgeon will be limited to a harvest rate of 10% or less.

Recreational Fisheries

All recreational fisheries through the 2017 fisheries season will require chum salmon release.

In the marine waters of Willapa Bay chum salmon are not directly targeted by the recreational salmon fishery. Small, directed fisheries for chum salmon have developed in freshwater areas open to salmon fishing. Even so annual harvest is very small, less that 1% of the total runsize. Regardless, in years when predicted abundance is low relative to the escapement goal, release requirements have been included in annual fishing regulations. Because of the low encounter rate single point barbless hooks have not been and are unlikely to be required when chum release requirements are in place unless coupled with Chinook and coho restrictions.

Commercial Fisheries

No commercial fisheries will be scheduled to occur during the chum period through the 2017 fishing season.

Steelhead Management

Spawner escapement goals for steelhead were developed using spawner/recruit and habitat information. Habitat assessments were based on juvenile densities in relation to stream gradient zones, providing estimates of what were called "potential parr production." Juvenile abundance information was obtained during low water periods (August and September), when the juvenile fish were close to smolting and most freshwater mortality had already occurred. Snorkel surveys were conducted on the mainstem regions to estimate juvenile densities while electrofishing was done within tributaries. Once parr densities were calculated, parr habitat utilization rates (parr/100m^2) could be estimated. With total available habitat determined escapement goals were then calculated.

No direct measurements were conducted on Willapa Bay tributaries other than estimating available habitat of each tributary where steelhead populations exist (WDG 1975). Parr density and total production was estimated using a "coastal average," which was generated from observations conducted on the Humptulips, Wynoochee and Satsop rivers. This information was then applied to Willapa Bay tributaries, for a total escapement goal of 10,000, with individual tributary goals as listed in Table 9.

Table 9. Watershed Specific Escapement Goals for Natural Spawning Steelhead.

Watershed	Steelhead
North River/ Smith	1,910
Willapa River	3,030
Palix River	1,230
Nemah River	370
Naselle River	3,070
Bear River	390

Table 10. – Artificial Production of Steelhead at Willapa Bay Hatcheries

Hatchery	**Current**	**Original Proposal**	**Option 1**	**Option 2**	**Final**
Forks Creek	85,000	TBD	TBD	TBD	85,000
Nemah	25,000	TBD	0	0	0
Naselle	50,000	TBD	TBD	TBD	50,000

In addition to recreational salmon fisheries, fisheries targeting hatchery origin steelhead occur throughout the Willapa Bay watershed, most notably in the Willapa, Nemah and Naselle rivers. In 2007, the Washington Fish and Wildlife Commission adopted a statewide steelhead management plan which includes overarching management goals and objectives. Consistent with these principals for natural production, artificial production and fishery management will be tailored more specifically to the unique attributes and management needs in the Willapa Bay region through the development of the Southwest Steelhead Regional Management Plan.

Sturgeon Management

A more comprehensive statewide sturgeon management plan is under development led by staff in the WDFW administrative Region 5. Meanwhile, an annual harvest guideline approach to management will be used for white sturgeon in Willapa Bay, which is driven by the annual harvest guidelines for the Lower Columbia River (LCR). Between the base years of 1988 to 1998, the average Willapa Bay catch was 3.81% of the overall harvest of Columbia River stock. In the case of Willapa Bay, once an annual allocation of LCR white sturgeon has been established for the coast, harvest is then divided between commercial and recreational users. This was done using the average recreational equivalents for the same base years. This method essentially uses the commercial/recreational harvest ratio found on the Columbia and applies it to Willapa Bay harvest. Using this 1988 to 1998 period, the commercial proportion is 58.11%. Fisheries are managed annually in Willapa Bay based on this proportion.

WDFW intends to manage the fishery for a total allowable commercial and recreational harvest of (1,878) white sturgeon in recreational equivalents[3]. This harvest ceiling is based on a 20% reduction from the 2000-2002 allowable harvest levels, which was the 1988-96 average percentage that Willapa Bay harvest represented when compared to the total lower Columbia stock harvested. This percentage of 4% (3.87% rounded to the nearest 0.5%) was applied to the number of lower Columbia recreational equivalents. Green sturgeon release is required in all fisheries due to their listing under the Endangered Species Act. Sturgeon are managed using minimum and maximum size limits. Oversized white sturgeon taken in recreational fisheries cannot be removed in total or in part from the water. The intent of this regulation is to eliminate the practice of hauling out an oversized sturgeon for a “trophy” photo before it is released. Commercial harvest opportunity will occur during any scheduled salmon fisheries from July 5 through October. The targeted sturgeon fisheries, which use 9-inch minimum mesh, may occur if there are sufficient numbers compared to the harvest ceiling.

[3] The harvest ceiling of 1,878 white sturgeon, in recreational equivalents, translates to an actual total catch ceiling of about 1,769 white sturgeon, or the rounded midpoint between the ceiling expressed in recreational equivalents and the entire catch expressed in commercial fishery equivalent (1,600 fish).

Adaptive Management

A critical element for successful long-term management where actions and objectives are regularly evaluated and reviewed is the process referred to as adaptive management. Adaptive Management incorporates research, monitoring and scientific evaluation to inform decisions making. An example where Adaptive Management will lead to successful long-term management of Willapa Bay fishery resources is in the context of mass marking hatchery fish. Mass marking will provide the ability to determine hatchery/wild composition on the spawning grounds as well as in hatchery broodstock allowing managers to estimate PNI and pHOS. This will provide information regarding habitat productivity at a watershed level informing management decision in both hatchery programs and natural stock management.

Short-term Goals –Action needed to informed decision making and Adaptive Management

- Research
- Test Fisheries
- Identification of Knowledge Gaps
- Catch Composition (Species-Stock-Origin)

Continued monitoring and evaluation – rigorous monitoring and adaptive management are essential to ensure that the appropriate types and amounts of data are collected to assess the effectiveness of management actions and informed decision making.

- Species - What
- Time - When
- Catch Areas – Where
- Gear - How

Technical models are important tools for effective harvest and hatchery management. Pre-season forecasts are based on a number of parameters depending on species and location. Basically, hatchery predictions are developed using release information multiplied by an average smolt-to-adult return. Natural returns are more difficult to assess since smolt out-migration is not monitored in Willapa Bay. As a result, estimates are generally based on adult-to-adult return informed by limited cohort analysis from biological sampling in fisheries, at hatcheries and on spawning grounds. This does not, however, provide information about actual spawning success, egg-to-smolt or marine survival. It should also be noted that pre-season forecasts using averages of historical information tend to track upward and downward trends in actual abundance but usually lag at bit in time.

Comparison of the Chinook pre-season forecasts with actual returns has exhibited a relatively close relationship, with a tendency to under forecast by about 12%. Recent years have shown greater differences largely due to an increasing run size trend.

Comparison of the coho pre-season forecasts with actual returns has shown a high degree of uncertainty, which is largely due to the return of single generation species (3-year-olds) that are strongly influenced by unpredictable environmental conditions in both marine and freshwater habitats. Multiple generation species such as Chinook, tend to buffer annual variations in environmental conditions, with the resulting expectation that forecasts are more reflective of actual returns.

Comparison of chum salmon pre-season forecasts with actual returns has shown a reasonable relationship. Like Chinook, pre-season chum forecasts (1990-2006) have slightly under estimated the actual returns. However, significant differences have occurred in some years. Notable deviations from the long-term trend were in 2005-2007, were preseason predictions far exceeded actual returns. This coincided with a sharp decrease in the abundance of chum and very poor marine survival in all species of salmon and steelhead.

Monitoring plans shall include assessment of technical management models to increase the certainty that annual management regimes will meet their resource management and conservation objectives.

Evaluation of individual populations should include the use of coded-wire tags, genetic analysis and new techniques when available and practical for application to the Willapa Bay Region.

Term of Plan

Appendices

Appendix 1.
Washington Fish and Wildlife Commission Policy (C-3619) - Hatchery and Harvest Reform

Appendix 2.
Commercial catch areas in Willapa Bay.

Appendix 3.
Fishery Management Timeframes with Run Timing Based on Commercial Catch for Willapa Bay Fisheries.

Appendix 4.
Willapa Bay Chinook, coho, and chum terminal run-reconstruction data 1990-2008.

Appendix 5.
Willapa Bay Hatchery Chinook Production Implementation Schedule, Anticipated Adult Return and % of Production Mass Marked with adipose fin clip.

Appendix 6.
Willapa Bay Hatchery Coho Production Implementation Schedule, Anticipated Adult Return and % of Production Mass Marked with adipose fin clip.

Appendix 1. Washington Fish and Wildlife Commission Policy (C-3619) - Hatchery and Harvest Reform.

FISH AND WILDLIFE COMMISSION
POLICY DECISION

POLICY TITLE: Washington Department of Fish and Wildlife Hatchery and Fishery Reform **POLICY NUMBER: C-3619**

Effective Date: November 6, 2009

Supersedes: N/A

See Also:

Approved by Miranda Wecker, Chair
Washington Fish and Wildlife Commission

Purpose
The purpose of this Washington Department of Fish and Wildlife policy is to advance the conservation and recovery of wild salmon and steelhead by promoting and guiding the implementation of hatchery reform.

Definition and Intent
Hatchery reform is the scientific and systematic redesign of hatchery programs to help recover wild salmon and steelhead and support sustainable fisheries. The intent of hatchery reform is to improve hatchery effectiveness, ensure compatibility between hatchery production and salmon recovery plans and rebuilding programs, and support sustainable fisheries.

General Policy Statement
The Washington Department of Fish and Wildlife (Department) shall promote the conservation and recovery of wild salmon and steelhead and provide fishery-related benefits by establishing clear goals for each state hatchery, conducting scientifically defensible-operations, and using informed decision making to improve management. Furthermore, it is recognized that many state operated hatcheries are subject to provisions under U.S. v. Washington and U.S. v. Oregon and that hatchery reform actions must be done in close coordination with tribal co-managers.

Artificial production programs will be designated as one of the following:

- Conservation Programs. Artificial production programs implemented with a conservation objective shall have a net aggregate benefit for the diversity, spatial structure, productivity, and abundance of the target wild population.

- Harvest Programs. Artificial production programs implemented to enhance harvest opportunities shall provide fishery benefits while allowing watershed-specific goals for the diversity, spatial structure, productivity, and abundance of wild populations to be met.

State commercial and recreational fisheries will need to increasingly focus on the

harvest of abundant hatchery fish. As a general policy, the Department shall implement mark-selective salmon and steelhead fisheries, unless the wild populations substantially affected by the fishery are meeting spawner and broodstock management objectives.

In addition, the Department may consider other management approaches provided they are as or more effective than a mark selective fishery in achieving spawner and broodstock management objectives.

Hatchery reform should be implemented as part of an "all-H" strategy that integrates hatchery, harvest, and habitat actions. Although this policy focuses on hatchery and harvest reform, in no way does it diminish the significance of habitat protection and restoration.

In implementing the policy guidelines the Department shall work with the tribes in a manner that is consistent with U.S. v. Washington and U.S. v. Oregon and other applicable state laws and agreements or federal laws and agreements.

Policy Guidelines

1. Use the principles, standards, and recommendations of the Hatchery Scientific Review Group (HSRG) to guide the management of hatcheries operated by the Department. In particular, promote the achievement of hatchery goals through adaptive management based on a structured monitoring, evaluation, and research program.

2. The Department will prioritize and 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 natural production working toward a goal of achieving the HSRG broodstock standards for 100% of the hatchery programs by 2015.

3. Develop watershed-specific action plans that systematically implement hatchery reform as part of a comprehensive, integrated (All-H) strategy for meeting conservation and harvest goals at the watershed and Evolutionarily Significant Unit (ESU)/Distinct Population Segment (DPS) levels. Action Plans will include development of stock (watershed) specific population designations and application of HSRG broodstock management standards. In addition, plans will include a time-line for implementation, strategies for funding, estimated costs including updates to cost figures each biennium.

4. Externally mark all Chinook, coho and steelhead artificial production that is intended to be used for harvest except as modified by state-tribal agreements or for conservation or research needs.

5. Secure necessary funding to ensure that Department-operated hatchery facilities comply with environmental regulations for passage facilities, water intake screening, and pollutant control systems.

6. Implement hatchery reform actions on a schedule that meets or exceeds the benchmarks identified in the 21st Century Salmon and Steelhead Framework.
7. Provide an annual report to the Fish and Wildlife Commission on progress of implementation.

8. Develop, promote and implement alternative fishing gear to maximize catch of hatchery-origin fish with minimal mortality to native salmon and steelhead.

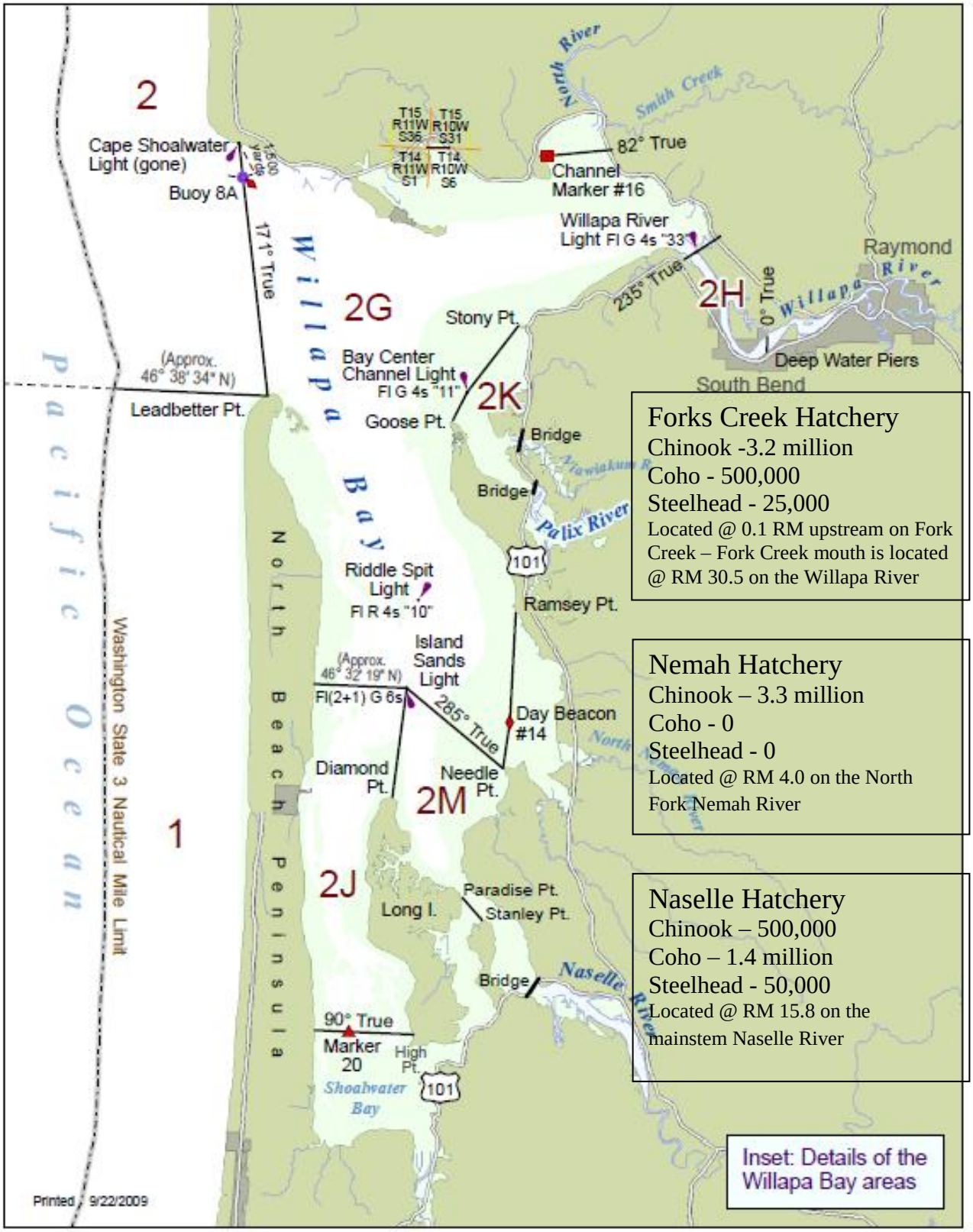
9. Seek funding from all potential sources to implement hatchery reform and selective fisheries.

10. Define "full implementation" of state-managed mark selective recreational and commercial fisheries and develop an implementation schedule.

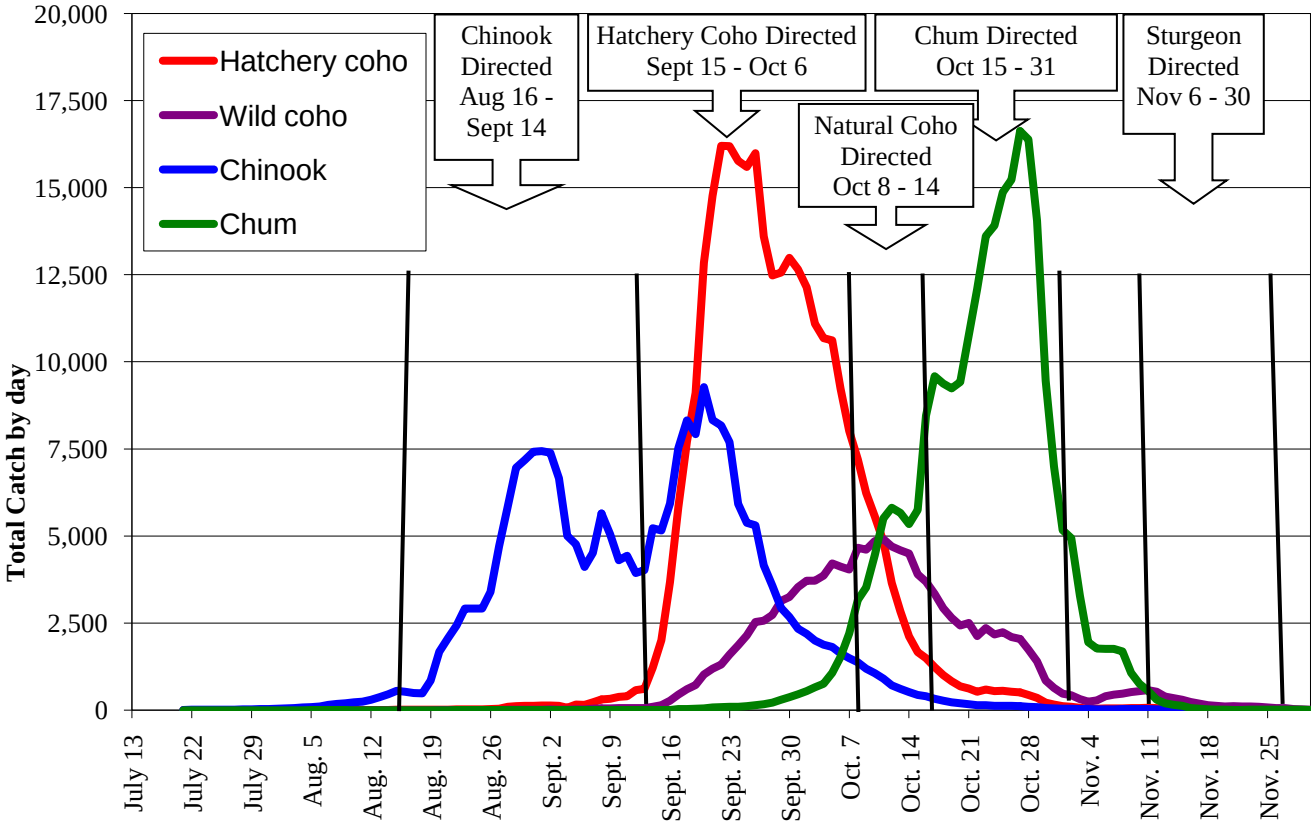
11. Work with tribal co-managers to establish network of Wild Salmonid Management Zones (WSMZ)1 across the state where wild stocks are largely protected from the effects of same species hatchery programs. The Department will have a goal of establishing at least one WSMZ for each species in each major population group (bio-geographical region, strata) in each ESU/DPS. Each stock selected for inclusion in the WSMZ must be sufficiently abundant and productive to be self-sustaining in the future. Fisheries can be conducted in WSMZ if wild stock management objectives are met as well as any necessary federal ESA determinations are received.

1 Wild Salmonid Management Zone is equal in meaning and application to the term of 'Wild Stock Gene Bank' as used and defined in the Statewide Steelhead Management Plan.

Appendix 2. Commercial catch areas in Willapa Bay.



Appendix 3. Fishery Management Timeframes with Run Timing Based on Commercial Catch for Willapa Bay Fisheries



Appendix 4. Willapa Bay Chinook, coho, and chum terminal run-reconstruction data 1990-2008.

Table 10. Willapa Bay Chinook Harvest, Terminal Harvest Rates (THR), Escapement and Runsize 1990-2008.

	Harvest				Escapement			Runsize
	Commercial	Sport	Total	THR	Wild	Hatchery	Total	Total
1990	18,936	1,076	20,012	0.49	4,368	16,853	21,221	41,233
1991	25,619	1,932	27,551	0.59	2,987	16,053	19,040	46,591
1992	36,659	2190	38,849	0.61	3,728	21,505	25,233	64,082
1993	31,153	4,252	35,405	0.65	3,033	16,214	19,247	54,652
1994	21,928	2,839	24,767	0.61	1,486	14,434	15,920	40,687
1995	25,490	2,903	28,393	0.59	2,854	17,226	20,080	48,473
1996	37,065	3,024	40,089	0.74	2,153	12,079	14,232	54,321
1997	12,311	2,404	14,715	0.46	3,852	13,729	17,581	32,296
1998	6,736	2,178	8,914	0.43	3,114	8,658	11,772	20,686
1999	265	1,906	2,171	0.21	1,360	6,966	8,326	10,497
2000	5,922	1,399	7,321	0.36	2,303	10,455	12,758	20,079
2001	5,459	2,121	7,580	0.38	2,161	10,099	12,260	19,840
2002	9,452	2,532	11,984	0.44	1,729	13,680	15,409	27,393
2003	7,488	3,242	10,730	0.38	2,732	14,628	17,360	28,090
2004	4,349	3,851	8,200	0.25	2,838	21,444	24,282	32,482
2005	6,523	6,630	13,153	0.39	1,978	18,514	20,492	33,645
2006	12,334	6,442	18,776	0.40	3,739	24,569	28,308	47,084
2007	4,112	2,579	6,691	0.30	1,907	13,822	15,729	22,420
2008	3,595				1,507	15,241		

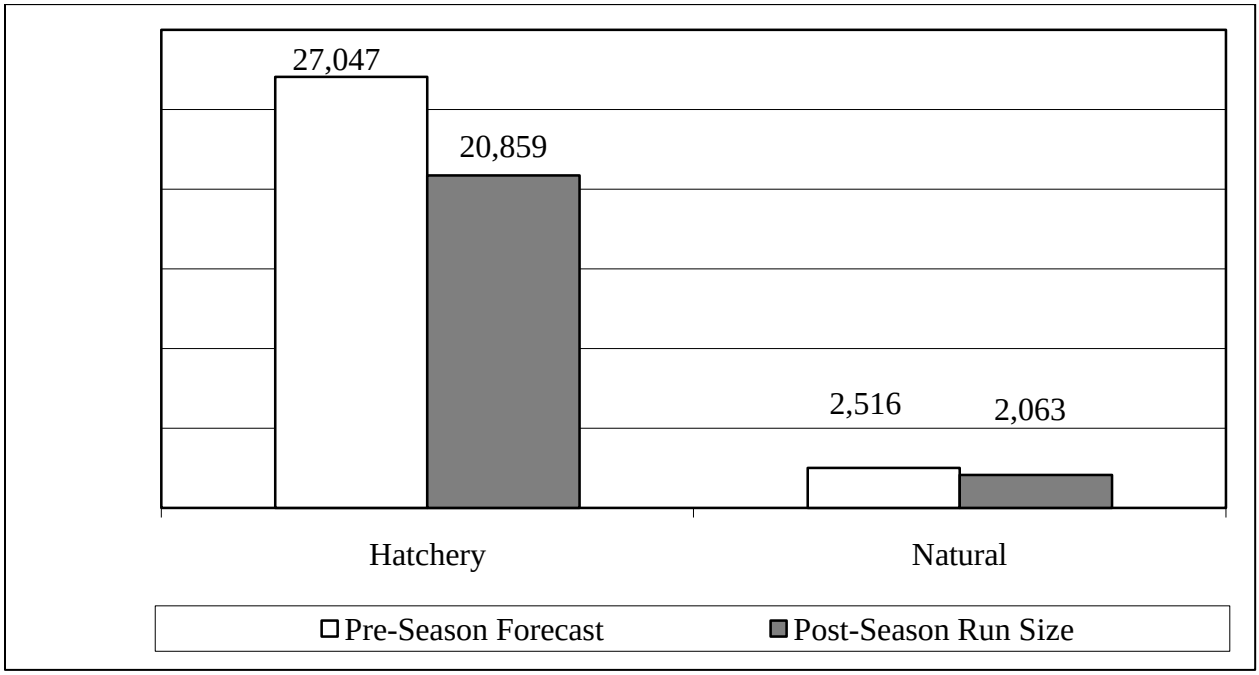


Figure 6. 2008 Pre-Season Forecast vs. Post-Season Terminal Runsize for Willapa Bay Chinook.

Table 11. Willapa Bay Coho Harvest, Terminal Harvest Rates (THR), Escapement and Runsize 1990-2008.

	Harvest				Escapement			Total
	Commercial	Sport	Total	THR	Wild	Hatchery	Total	Runsize
1990	48,026	1,139	49,165	0.675		23,678	23,678	72,843
1991	95,569	6,258	101,827	0.620		62,338	62,338	164,165
1992	10,767	2,031	12,798	0.453		15,443	15,443	28,241
1993	19,837	1,620	21,457	0.642		11,976	11,976	33,433
1994	11,710	2,358	14,068	0.471		15,798	15,798	29,866
1995	33,554	1,743	35,297	0.502	4,582	30,471	35,053	70,350
1996	38,316	4,052	42,368	0.396	15,711	48,854	64,565	106,933
1997	1,550	806	2,356	0.169	4,934	6,691	11,625	13,981
1998	13,140	852	13,992	0.403	13,807	6,902	20,709	34,701
1999	5,467	2,836	8,303	0.204	9,628	22,823	32,451	40,754
2000	10,193	1,780	11,973	0.186	23,031	29,387	52,418	64,391
2001	31,837	5,689	37,526	0.267	48,414	54,359	102,773	140,299
2002	59,435	5,683	65,118	0.377	58,703	48,871	107,574	172,692
2003	66,460	5,881	72,341	0.385	49,398	66,115	115,513	187,854
2004	16,533	2,305	18,838	0.246	38,672	19,216	57,888	76,726
2005	50,031	3,867	53,898	0.453	24,493	40,679	65,172	119,070
2006	19,914	811	20,725	0.504	12,563	7,831	20,394	41,119
2007	8,210	955	9,165	0.272	13,723	10,786	24,509	33,674
2008	16,699				18,474	11897		

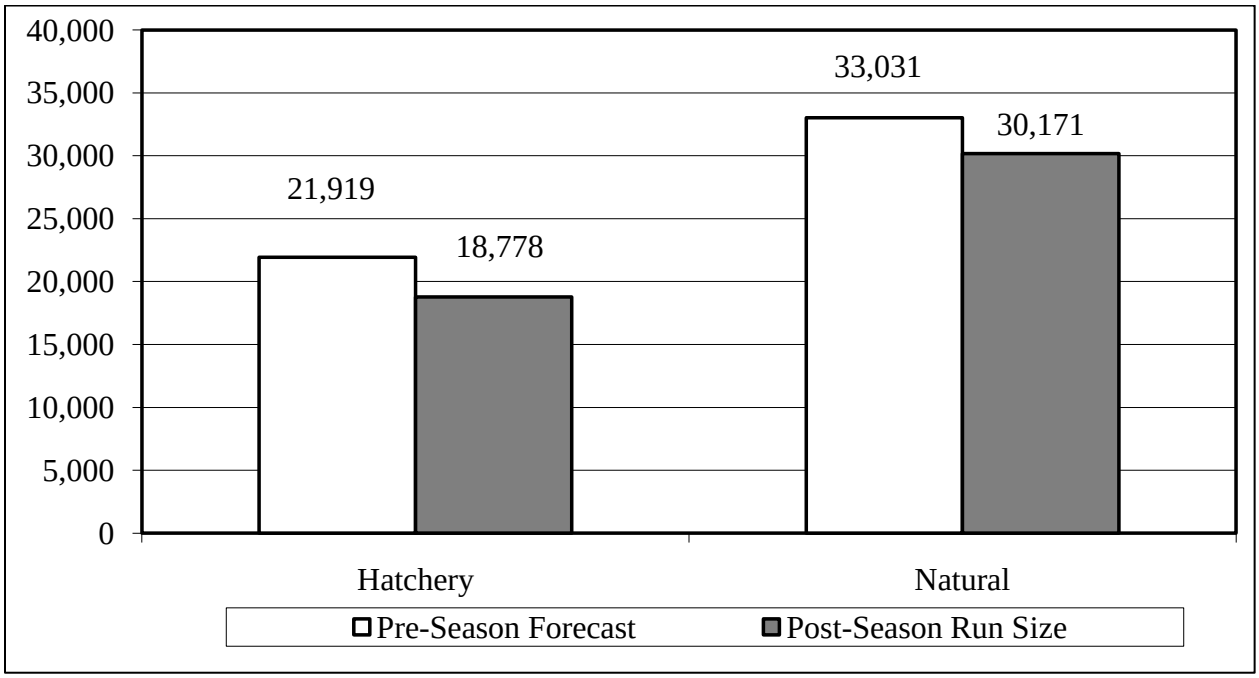


Figure 7. 2008 Pre-Season Forecast vs. Post-Season Terminal Runsize for Willapa Bay Coho.

Table 12. Willapa Bay Chum Harvest, Terminal Harvest Rates (THR), Escapement and Runsize 1990-2008.

	Harvest				Escapement			Total
	Commercial	Sport	Total	THR	Wild	Hatchery	Total	Runsize
1990	5,420	284	5,704	0.144	17,762	16,221	33,983	39,687
1991	43,768	512	44,280	0.496	33,959	11,059	45,018	89,298
1992	88,926	651	89,577	0.630	37,068	15,644	52,712	142,289
1993	12,685	741	13,426	0.293	31,017	1,317	32,334	45,760
1994	628	633	1,261	0.036	30,526	3,521	34,047	35,308
1995	1,954	156	2,110	0.076	24,695	806	25,501	27,611
1996	1,730	216	1,946	0.086	20,011	542	20,553	22,499
1997	18	172	190	0.006	33,314	658	33,972	34,162
1998	9,723	584	10,307	**0.134**	**65,101**	1,304	66,405	76,712
1999	1,118	254	1,372	0.052	24,512	573	25,085	26,457
2000	6,458	201	6,659	**0.142**	**40,030**	251	40,281	46,940
2001	23,353	222	23,575	0.440	29,389	581	29,970	53,545
2002	31,765	662	32,427	**0.350**	**59,243**	850	60,093	92,520
2003	36,736	239	36,975	**0.436**	**47,347**	450	47,797	84,772
2004	29,720	110	29,830	**0.260**	**84,021**	905	84,926	114,756
2005	16,103	46	16,149	0.574	11,924	59	11,983	28,132
2006	8,062	168	8,230	0.356	14,717	190	14,907	23,137
2007	280	6	286	0.016	17,085	171	17,256	17,542
2008	3,377				9,008	323		

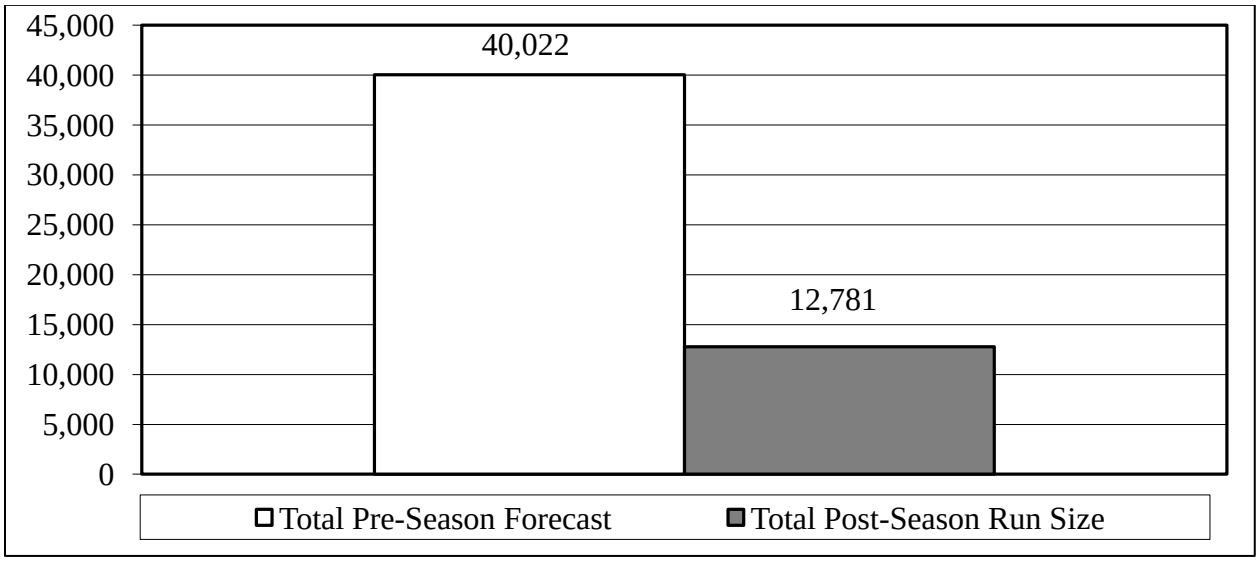


Figure 8. 2008 Pre-Season Forecast vs. Post-Season Terminal Runsize for Willapa Bay Chum.

Appendix 5. Willapa Bay Hatchery Chinook Production Implementation Schedule, Anticipated Adult Return and % of Production Mass Marked with adipose fin clip.

Chinook	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
					Years							
Forks Creek Fall Chinook												
egg take year		New Program										
release year/number		2,000,000	3,200,000	3,200,000	3,200,000	3,200,000	3,200,000					
				3yo	4yo	5yo	6yo					
					3yo	4yo	5yo	6yo				
return years						3yo	4yo	5yo	6yo			
							3yo	4yo	5yo	6yo		
								3yo	4yo	5yo	6yo	
									3yo	4yo	5yo	6yo
Projected Forks bound Adult return			8,585	8,627	8,859	10,473	12,085	12,222	12,222	12,222	12,222	12,222
MM began in 2006 of BY 2005; % of returns			98%	100%	100%	100%	100%	100%	100%	100%		
Nemah Fall Chinook												
egg take year		New Program										
release year/number		2,000,000	3,000,000	3,000,000	3,300,000	3,300,000	3,300,000					
				3yo	4yo	5yo	6yo					
					3yo	4yo	5yo	6yo				
return years						3yo	4yo	5yo	6yo			
							3yo	4yo	5yo	6yo		
								3yo	4yo	5yo	6yo	
									3yo	4yo	5yo	6yo
Projected Nemah bound Adult return			5,957	6,765	8,487	9,998	11,551	12,160	12,570	12,604	12,604	12,604
MM began in 2007 of BY 2006; % of returns			79%	99%	100%	100%	100%	100%	100%	100%		
Naselle Fall Chinook												
egg take year		New Program		Start Integrated								
release year/number		3,000,000	800,000	800,000	500,000	500,000	500,000					
				3yo	4yo	5yo	6yo					
This may require a mark selective 2M fishery.					3yo	4yo	5yo	6yo				
						3yo	4yo	5yo	6yo			
return years							3yo	4yo	5yo	6yo		
								3yo	4yo	5yo	6yo	
									3yo	4yo	5yo	6yo
Projected Naselle bound Adult return			16,622	15,462	10,532	6,338	3,099	2,354	1,944	1,910	1,910	1,910
MM began in 2007 of BY 2006; % of returns			39%	98%	100%	100%	100%	100%	100%	100%		
Total Willapa Bay Chinook Release		7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000					
Expected Total Hatchery Chinook Adult Return to Willapa Bay			**31,163**	**30,855**	**27,878**	**26,809**	**26,735**	**26,736**	**26,736**	**26,736**	**26,736**	**26,736**
Expected % mass marked of hatchery adult return			89%	99%	100%	100%	100%	100%	100%	100%	100%	100%

Appendix 6. Willapa Bay Hatchery Coho Production Implementation Schedule, Anticipated Adult Return and % of Production Mass Marked with adipose fin clip.

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Forks Creek										
egg take year			**New Program**							
release year/number			600,000	300,000	300,000	300,000				
return years				3yo	3yo	3yo	3yo	3yo	3yo	3yo
Forks Creek bound Adult return				15,300	7,650	7,650	7,650	7,650	7,650	7,650
Nemah										
egg take year			**No Program**							
release year/number			500,000	0						
return years				3yo	3yo	3yo	3yo	3yo	3yo	3yo
Nemah bound Adult return				12,750	0	0	0	0	0	0
Naselle										
egg take year			**New Program**							
release year/number			600,000	1,400,000	1,400,000	1,400,000	1,400,000	1,400,000	1,400,000	
return years				3yo	3yo	3yo	3yo	3yo	3yo	3yo
Naselle bound Adult return				15,300	35,700	35,700	35,700	35,700	35,700	35,700
Total Willapa Bay Coho Releases			**1,700,000**	**1,700,000**	**1,700,000**	**1,700,000**	**1,700,000**	**1,700,000**	**1,700,000**	
Expected Hatchery Coho Adult Return to Willapa Bay				**43,350**	**43,350**	**43,350**	**43,350**	**43,350**	**43,350**	**43,350**

MM%- All coho are currently returning mass-marked