WDFW Hatchery and Fishery Reform Policy Implementation Assessment

Draft Progress Report, 2009-2019

Andrew Murdoch
Gary Marston

February 27, 2020

Table of Contents

Executive Summary

The Hatchery and Fishery Reform Policy #C-3619 was adopted by the Fish and Wildlife Commission (FWC) in 2009. The policy was intended to guide a scientific and systematic redesign of the hatchery programs operated by the Washington Department of Fish and Wildlife (WDFW) in order to improve hatchery effectiveness in meeting management goals, including supporting sustainable fisheries. In 2018, the FWC assigned WDFW to review all sections and aspects of Policy #C-3619. Specifically, WDFW scientists were tasked with: *i*) reviewing policy performance (i.e., effectiveness) relative to hatchery reform actions specified in the eleven policy guidelines, as reported herein; and, *ii*) reviewing and updating the science on hatchery reform, as presented in a separate report.

After initial scoping, it was determined that the required data to perform an *ad hoc* hatchery effectiveness analysis for 159 hatchery programs was not available. Furthermore, given that for most populations, excluding the Upper Columbia, data on the abundance of hatchery fish on the spawning grounds has only been available since 2010 (due to lack of mass-marking), typical analytical approaches (i.e., Before-after-Control-Impact) could not be utilized. While lack of data prevented a policy performance review, an assessment of policy implementation was possible for many of the hatchery programs. As such, evaluating policy implementation since 2009 is the focus this report, including relevant fishery reform actions. Implementation effectiveness, or lack thereof, will directly influence future performance results.

Implementation was assessed directly for guidelines that explicitly stated a quantifiable metric (e.g., externally mark all Chinook, Coho and steelhead). For more ambiguous guidelines, readily available surrogate metrics were used to quantify implementation and may not completely encompass the intent of the guideline (e.g., Guideline 3). Implementation of the principles and systemwide recommendations of the Hatchery Scientific Review Group (HSRG) primarily focused on Chinook, Coho and steelhead programs (Guidelines 1 and 2). While steady progress in hatchery reform implementation has been achieved over the last 10 years, more work is needed in all areas. While lack of funding was a common reason that prevented implementation of some guidelines, factors outside of the policy (e.g., federal Endangered Species Act (ESA) requirements, tribal-state co-manager agreements, FERC, Mitchell Act) often associated with the funding source also influenced implementation, both positively and negatively.

Lack of quantifiable harvest program goals and a comprehensive statewide monitoring and evaluation program are areas of special concern. Defining program success and collecting and analyzing data to adaptively manage our programs are critical missing components. Conversely, hatchery operations, externally marking hatchery fish, Chinook smolt survival, and facility compliance with environmental regulations were found to be well implemented. Fishery reform actions (i.e., mark-selective fisheries and alternative gear types) were also well implemented across the State. The number of mark-selective fisheries peaked in 2016, but declined thereafter, due to the recent decline in overall salmon abundance. Harvest using

alternative gear types was constrained, in part, by lack of hatchery fish abundance at locations and where implemented.

At the end of this report, following our comprehensive assessment of policy implementation, we provide recommendations specific to the findings of this report. These recommendations focus on the importance of ensuring that future performance evaluations are possible via monitoring, evaluation, and adaptive management programs developed for each hatchery program statewide.

Washington Department of Fish and Wildlife
Hatchery and Fishery Reform Policy # C-3619

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 timeline 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) 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.

Policy Performance Review

The Fish and Wildlife Commission (FWC) directed WDFW to review all sections and aspects of the policy to include a review of performance results since the policy was adopted. During this review period, the FWC also suspended specific guidelines (i.e., 1, 2, and 3), excluding steelhead, due to potential concerns that the policy may reduce flexibility in future hatchery program maintenance or enhancement opportunities. Quantitative assessments (i.e., performance results) with the appropriate statistical power on the effectiveness of management actions (e.g., hatchery or fishery reform, habitat restoration, etc.,) on the status of a salmon populations in the natural environment are rarely conducted (e.g., Vendetti et al. 2018). A performance evaluation of a hatchery reform action, like any other large-scale management action in the natural environment, require specific data including 1) an evaluation of data prior to implementation (i.e. before-time period), 2) an assessment of the effectiveness of the action implemented (i.e., treatment effect), 3) an adequate post-implementation time period (i.e., after-time period) and finally 4) similar data from a population(s) spanning both the before- and after-time periods in which no reform actions were implemented (i.e., control). Ideally, these data would be from a population(s) with no hatchery influence (i.e., wild salmonid management zone) and serve to control for the natural variability observed in salmon data time series (e.g., changing ocean conditions). Hence, evaluating a hatchery reform action implemented without a complete statistical design (i.e., post-hoc) or simply opportunistically may be problematic.

Understandably, given the uncertainty (i.e., lack of empirical studies) associated with some hatchery reform actions (e.g., pHOS goals), an evaluation of the policy and subsequent actions taken warrant a quantitative assessment of the effectiveness in achieving policy goals. However, upon initial scoping of this task (i.e., 11 guidelines and 159 hatchery programs), it was determined that before undertaking such an assessment, that would likely include a similar effects analysis of non-WDFW hatchery programs (i.e., multiple treatment effects) in order to differentiate the effects of WDFW hatchery programs, an assessment of how well the 11 guidelines were implemented was required. The assumption that all 11 guidelines were implemented shortly after (i.e., 1-2 years) the policy was adopted may not be true. Variability in both policy guideline implementation and the effectiveness of those reform actions implemented would directly influence a program-specific performance evaluation. Without an implementation assessment, lack of improved performance results (i.e., more wild fish) since

the policy was adopted could be mistakenly attributed to an ineffective guideline rather than a guideline ineffectively implemented. An assessment of policy guideline implementation is not without its own challenges, but could also highlight specific populations and hatchery programs, if any, where a future quantitative assessment is possible.

Additional programmatic issues exist, other than study design, that prevent a quantitative analysis of hatchery reform actions. Policy #C-3619 was adopted in 2009, therefore a performance evaluation in 2019 may be premature simply due to the timing of implementation and more importantly the average generation time of Chinook Salmon (i.e., five years). For example, a project to reduce the proportion of hatchery origin Chinook Salmon on the spawning grounds (pHOS) in order to meet HSRG guidelines for a segregated program in a primary population (70% to 5%) was fully implemented in 2010. The first year in which all natural origin fish were produced under this action would be 2015. In this "best case" scenario, the after-period would consist of four years (2015-2018), which would likely not provide the adequate statistical power to make any inferences on the effectiveness of the hatchery reform action (i.e., minimize potential negative effects of hatchery fish). In general, as the time series during the pre- and/or post-implementation period increases (i.e., more years), the minimal detectable difference or the smallest difference in abundance that can be measured statistically decreases.

An implementation schedule of hatchery reform actions and objectives is not available. Understandably, large hatchery reform actions, those with the greatest potential treatment effect, took several years to implement following the adoption of the policy (e.g., Forks Creek Chinook program reduction from 3.2M to 0.35M implemented in 2015 to achieve hatchery reform goals: see Willapa Bay Policy C-3622), and as a result, data during the post-implementation period is only now being collected. However, time or the number of years in the post-implementation is not the only reason why the effectiveness of hatchery reform actions cannot be evaluated. The last release of fall Chinook Salmon (2M) in the Elochoman River occurred in 2008. A weir was installed in 2009 to remove returning hatchery fish in order to achieve a 5% pHOS required for a primary population in the local adaptation phase. Hence, from 2010 to 2013 returning natural origin progeny (ages 1-4) would be returning from years with parental pHOS incrementally decreasing down to 5% or lower, assuming hatchery reform actions were 100% effective. Population abundance and productivity (recruits/spawner) before 2010, during the transition to reduced parental pHOS, and after 2013 could be compared for differences using a Before-After-Control-Impact (BACI) analysis, by controlling for natural variability using data from other populations that have not been subject to hatchery reform actions. Unfortunately, there are numerous factors that complicate such an analysis:

1. Mass-marking went into effect in 2005 and as a result pHOS estimates are not available prior to 2010 (i.e., no pHOS data for the "before period").
2. Given the size of the hatchery program relative to the natural population, even small deviations in the mass marking rate (97% not 100%) would result in pHOS > 5% assuming 100% weir efficiency.

3. The weir was not 100% efficient in any year, resulting in marked hatchery spawners above the weir, in addition to unmarked hatchery spawners (as described in #2 above).
4. The weir was not installed below all potential spawning areas in the Elochoman River. Hence, not all hatchery fish were captured at the weir and some spawned below the weir.
5. A weir was only installed in the Elochoman River. No weir was installed on Skamakowa Creek, which is part of the Elochoman-Skamakowa Population. Population pHOS goals would not be met even if there were no hatchery fish in the Elochoman portion of the Elochoman-Skamakowa population due to the hatchery fish spawning in the Skamakowa portion.
6. The reduction in pHOS is confounded by potential weir impacts on wild fish; the weir may be unintentionally influencing the natural origin run timing and spawning distribution of natural origin fish resulting in possible negative effects on population productivity, as appears to be occurring in the Coweeman River.
7. Ongoing hatchery reform efforts in neighboring rivers (e.g., changes in Select Area Bright production by Oregon and Grays River weir operation) changed the numbers of stray hatchery spawners in neighboring populations, influencing their ability to serve as controls.
8. Unless changes in productivity over one generation were very large, they would likely be undetectable due to very low statistical and high background "noise" in population productivity (e.g., variability among rivers and over time, such as due to ocean conditions).

In summary, despite closing a hatchery program and installing a weir to remove excess hatchery fish, pHOS goals for the Elochoman-Skamakowa population were not met and were nearly met only in one year in the Elochoman River. Furthermore, effectiveness of this reform action (reduction in pHOS) is difficult to assess because pHOS before the action was implemented is unknown. While this may be a unique example, it does highlight the complexity of implementing and evaluating management actions in the natural environment. Any one of the eight factors described above could result in erroneous conclusions on the effectiveness of hatchery reform.

Policy Implementation Assessment

Given the scope of the policy, it was not possible to collect, compile or generate new metrics that were not already available. While some guidelines have clear metrics from which an assessment can be quantified, others are more ambiguous. In those cases, metrics were suggested that capture the intent of the guideline. However, in cases where the intent of the guideline is unclear, alternative metrics may need to be included. This report provides a high-level assessment of how guidelines have been implemented (i.e., report card) and a more detailed summary report that includes an examination of the implementation metrics at a geographic- (regionally) or species-specific scale where appropriate. The summary report also reports HSRG-specific principles and recommendations as applied to the policy guidelines. The HSRG's 3 principles of hatchery management contain 17 recommendations. While some policy guidelines are well aligned with these recommendations some are not. We developed a matrix

to illustrate how the principles and recommendation of the HSRG were assessed relative to the policy guidelines (Table 1).

Table 1. Matrix illustrating how WDFW guidelines were aligned with HSRG principles and recommendations.

WDFW Policy Guideline	HSRG Recommendation		
	Principle	Number	Brief Description
1	1	1	Conservation goals for the population
		2	Harvest goals for the program
		3	Coordinate goals with other populations
	2	4	Identify the purpose of the program
		5	State scientific assumptions
		6	Select broodstock management strategy
		7	Size of hatchery program
		10	Hatchery program have self-sustaining broodstock
		11	Comprehensive effects analysis of all programs
		13	Maximize survival of hatchery fish
	3	15	Prioritize research on RRS studies
		16	Adaptively manage hatchery programs
		17	Discontinue or modify programs if risks too high
2	2	8	Meet HSRG broodstock standards
3	3	14	Regularly review goals and performance of programs
4	2	9	Achieve full use of hatchery fish
5	2	12	Ensure hatchery facilities are in compliance
6	NA	NA	
7	NA	NA	
8	NA	NA	
9	NA	NA	
10	NA	NA	
11	NA	NA	

WDFW regional report cards are presented in Appendix A and program specific assessment of HSRG recommendations are provided in Appendix B1-6. All assessments where made using a stoplight chart under the following definitions:

Report Card	Definition	Percent of Implementation
🟢	Full or nearing full implementation	76% to 100%
🟡	Good progress towards full implementation	51% to 75%
🟠	Some progress towards full implementation	26% to 50%
🔴	Little to no progress towards full implementation	0% to 25%

Report Card

Policy Guideline	Progress
1 Use the principles, standards, and recommendations of the Hatchery Scientific Review Group (HSRG) to guide the management of hatcheries operated by the Department. b. In particular, promote the achievement of hatchery goals through adaptive management based on a structured monitoring, evaluation, and research program. Principles: 1. Develop Clear, Specific, Quantifiable Harvest and Conservation Goals for Natural and Hatchery Populations within an "All H" Context 2. Design and Operate Hatchery Programs in a Scientifically Defensible Manner 3. Monitor, Evaluate and Adaptively Manage Hatchery Programs	   
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 timeline 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.[1]	
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) 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] Not assessed because specific hatchery reform 2020 benchmarks were redundant with existing guidelines.

Implementation Assessment of Policy Guidelines:

Guideline 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.

Principle 1: Develop Clear, Specific, Quantifiable Harvest and Conservation Goals for Natural and Hatchery Populations within an "All H" Context

Recommendation 1: Express conservation goals in terms of a population's biological significance (Primary, contributing, Stabilizing) and viability (natural origin spawning abundance and productivity), and identify the current recovery phase of the population and the associated triggers for phase shifts.

Intent: Establish clear quantitative goals for conservation programs to ensure hatchery programs are consistent with recovery plans.

For salmon and steelhead populations associated with a hatchery program, the biological significance has been identified, consistent with recovery plans where applicable, which was the original intent of the policy. However, in 2015 the HSRG provided guidance on recovery phases to capture the complexities of implementing broodstock management practices on populations with different levels of abundance and productivity, and this has also been incorporated into the policy implementation. Since 2015, most listed populations also have a recovery phases identified. However, the criteria (i.e., triggers) used to establish the current phase of recovery or when to move to the next phase are not developed for most programs. Scientifically defensible methods using population specific data for deriving recovery phases and triggers required to move between phases have not been employed statewide. Additional work is needed to develop triggers (e.g., based on population viability analysis) for each recovery phase that can be applied consistently across all populations, in part, because for integrated programs the recovery phase determines the proportionate of natural influence (PNI) goal.

Natural origin abundance and productivity goals are identified for most ESA listed populations. While escapement goals have been identified for most non-listed populations, productivity goals have not. Productivity should be available from stock-recruitment models used to set escapement goals unless these goals were developed under a different process.

Full implementation of this recommendation was not accomplished for two primary reasons: 1) some populations lack abundance and productivity goals and 2) a co-manager agreed to method to determine recovery phase triggers for all populations has not been fully developed and applied since the adoption of this metric in 2015. Lack of accurate and precise spawner abundance estimates and staff capacity to run population specific models will prevent full implementation.

1-1. Have goals for programs been defined in terms of the population's biological significance (biological designation), phase of recovery (preservation, recolonization, local adaptation or full recovery) natural origin spawner abundance and productivity? To what extent has a monitoring and evaluation (M & E) program and resulting adaptive management contributed in meeting program goals?

Metric: Biological designation, recovery phase and triggers, natural origin recruits (NOR) goal, and recruit per spawner (R/S) ratio
Data provider: Eric Kinne/ HEAT Unit

Metric	Region						Total
	1	2	3	4	5	6	
# Programs	7	12	3	28	43	66	159
Designation	7/7	10/10	2/2	28/28	42/42	61/61	150/150
Phase	7/7	10/10	2/2	19/28	42/42	59/61	139/150
Triggers	0/7	0/10	0/2	2/28	2/42	3/61	5/150
NOR goal	7/7	10/10	2/2	18/28	35/42	5/61	77/150
R/S	7/7	10/10	2/2	18/28	35/42	5/61	77/150
Total	28/35	40/50	8/10	85/140	156/210	133/305	450/750
%	80	80	80	61	74	44	60
Assessment	●	●	●	●	●	●	●

Note: R/S goals for non-ESA populations not established

Recommendation 2: Express harvest goals in terms of a population's contribution to specific fisheries.

Intent: Establish clear quantitative goals for harvest programs to ensure hatchery programs are meeting management goals.

WDFW has not established harvest goals by program, in part, due to the complexity of how fisheries are managed and executed. Using stock-specific forecast models and fishery-specific harvest models, WDFW and tribal co-managers develop a suite of preseason fishery options. Many fisheries are adaptively managed using in-season information (i.e., creel survey or test fishery data), while others are evaluated retrospectively. While mixed stock fisheries may offer more consistent (i.e. annually) fishing opportunities, they also may pose greater risk to non-target fish or stocks (e.g., Endangered Species Act (ESA) listed). Most problematic, from a program-specific goal perspective, are fisheries that are managed based on the exploitation rate impact they have on various population(s) of concern (i.e., mixed stock fishery). Variability in run timing or abundance and model uncertainty may severely limit the harvest of hatchery origin fish, in certain times and locations where limiting stocks are present. Also, mixed stock fisheries potentially limit the maximum harvest of program-specific hatchery origin fish. Terminal fisheries typically are more responsive to reducing impacts on non-target species and/or stocks and may allow greater access to harvest surplus hatchery-origin fish.

Data for some stocks (i.e., CWT) does exist to determine the relative contribution of most Chinook and Coho hatchery programs to marine area mixed stock fisheries. Hence, under the current harvest paradigm, the median number of fish harvested from each program by fishery type (e.g., ocean commercial, ocean sport, freshwater sport, and tribal) can be used as quantitative goals. These data can inform the size and distribution of hatchery programs, while considering the needs of co-managers. Furthermore, hatchery programs where large surpluses occur may be accessed through refined targeted harvest in areas near the hatchery (terminal fisheries). However, if hatchery programs exhibit relatively low harvest: escapement ratios, fisheries should be redefined in space or time or both to better maximize the harvest of hatchery fish. Alternatively, hatchery programs that disproportionality contribute little to fisheries should be modified or closed.

1-2. Are harvest program goals defined by specific fisheries? Have fisheries been adaptively managed to obtain these goals?

Metric: Harvest goal by fishery or type
Data provider: Kirt Hughes/FRPMs

Metric	Region						Total
	1	2	3	4	5	6	
# Programs	4	4	3	23	35	55	124
# Goals	0	0	0	0	0	0	0
%	0	0	0	0	0	0	0
Assessment	●	●	●	●	●	●	●

Recommendation 3: Ensure conservation and harvest goals for individual populations are coordinated and compatible with those for other populations that might be affected.

Intent: Achieve conservation and harvest goals while not negatively affecting non-target populations or other hatchery programs. In addition, ensure the overall cumulative effect of hatchery programs on wild fish is not negatively impacting recovery goals.

It is unclear what, if any, metric(s) can or should be used to assess this recommendation. For example, if harvest is not constrained by incidental take of non-target fish (wild or hatchery), a possible inference may be that hatchery goals are compatible with both harvest and conversation goals of all populations affected. Currently, hatchery programs do not have specific harvest goals and a majority of hatchery fish are harvested in mixed-stock fisheries. Hence, assessing this recommendation under the current harvest paradigm is problematic. However, some mixed stock fisheries use an exploitation rate to ensure conservation goals of a certain stock(s) are not unduly negatively impacted by the fishery (e.g., Columbia River URB fall Chinook, Snake River B-run steelhead, and Puget Sound Chinook). Furthermore, conservation goals must also take into account tribal harvest impacts which are also not population specific (i.e., mixed stock). Terminal fisheries are typically managed to achieve escapement goals (both

natural spawning and broodstock), not harvest goals, using creel surveys and adaptively managing the fishery while monitoring impacts to non-target stocks (i.e., when the impact threshold is reached, the fishery is closed). Alternatively, there may be other metrics that are more suitable or applicable for this recommendation. Until metrics have been identified that permit an assessment of implementation this recommendation will not be assessed.

1-3. Are individual hatchery program goals compatible with goals of the natural populations or other populations that may be affected?

Metric: Undetermined

Principle 2: Design and Operate Hatchery Programs in a Scientifically Defensible Manner

Recommendation 4: Identify the purpose of the hatchery program (i.e., conservation, harvest or both)

Intent: Clearly define how hatchery fish will be contributing to management goals (i.e., conservation or harvest) and ensuring the goal of the program is compatible with recovery.

Of the 159 hatchery programs, WDFW has identified 124 harvest and 35 conservation hatchery programs. Hatchery programs are predominately located in Western Washington (86%). Of which, the majority are harvest programs (83%). In Eastern Washington, harvest and conservation programs are equally represented (50%). All hatchery programs in Eastern Washington and half the programs in Region 5 were initiated as mitigation for hydropower development. In general, the purpose of these programs is linked to the source of mitigation and documented in legal agreements. Harvest programs are to replace loss production due to the inundation of spawning and rearing habitat. Conservation programs are associated with unintentional mortality (juvenile and adult) associated with the operation of the hydro-system (turbine/passage related mortality).

1-4. Has the purpose (conservation or harvest) of the hatchery program been clearly identified?
Metric: Purpose by program
Data provider: Eric Kinne/ HEAT Unit

Metric	Region						Total
	1	2	3	4	5	6	
# Programs	7	12	3	28	43	66	159
# Purpose	7	12	3	28	43	66	159
Harvest	4	4	3	23	35	55	124
Conservation	3	8	0	5	8	11	35
%	100	100	100	100	100	100	100
Assessment	●	●	●	●	●	●	●

Recommendation 5: Explicitly state the scientific assumptions under which a program contributes to meeting the stated population goals and hatchery purpose.

Intent: Describe the biological justification (i.e., number of fish released) for the hatchery program to include assumptions and hypotheses used in the justification. The biological justification must also be compatible with the purpose of the program and include the associated benefits and risks in order to be scientifically defensible.

The All "H" Analyzer (AHA) is an analytical tool used to examine different scenarios under which a population is influenced by hatchery programs, habitat restoration, harvest and hydroelectric development (i.e., all 4 H's). Inherent within the model, biological assumptions about the hatchery program, natural population dynamics, habitat condition, and harvest rates are required as input variables (Table 1). AHA also uses the Ford (2002) model to estimate gene flow between hatchery and natural fish and the resulting impact on fitness due to domestication selection.

The In-Season Implementation Tool (ISIT) (HSRG 2017) was subsequently developed to help managers make annual adjustments about hatchery and harvest management in order to better achieve biological targets for the population. In addition to the same assumptions required for AHA, ISIT required annual management targets consistent with identified hatchery reform strategies or actions.

A key missing component from these models are the effects of ecological interactions between hatchery and natural fish. Busack et al. (2005) and Pearsons and Busack (2012) developed a model (PCD Risk) to better assess the effects of hatchery fish (predation, competition and disease) on natural fish. However, this model also required extensive data both hatchery and natural fish and some critical assumptions (Table 2).

In addition, potential genetic introgression effects from early winter and early-summer steelhead segregated programs in Puget Sound and along the Washington coast (a risk not adequately addressed in other models) was assessed using a model developed by WDFW (Hoffman 2014). This model uses the spawn-timing overlap of hatchery and wild populations and assumed stray rates for hatchery fish to the natural spawning grounds to provide estimates of gene-flow. Gene flow assumptions in this model are being validated using genetic analysis in the Puget Sound region.

Table 2. Key assumptions of models used in developing hatchery program size.

Model	Component	Assumptions
AHA/ISIT	Hatchery	Number of broodstock
		Number fish released
		In-hatchery survival
		Post-release survival
		Stray rates
	Harvest	Escapement goal
		MSY
		Ocean harvest rate
		Terminal harvest rate
	Habitat	Capacity (BH function)
		Productivity (BH function)
	Hydro-system	Juvenile survival
		Adult survival
PCD Risk	Predation	Piscivory rate
	Competition	Habitat complexity
		Habitat overlap
		Dominance probability
		Max. daily encounters
	Disease	Disease mort. rate
Hoffman Gene Flow	Hatchery	Spawn timing in natural stream
		Spawning distribution in natural stream
		RRS of H x H
		RSS of H x W
		Homing/stray rates
	Natural	Spawn timing in natural stream
		Spawning distribution in natural stream

From 2005 through 2010, WDFW used AHA to examine all hatchery programs to set the program sizes. ISIT has been used annually but rather inconsistently for a smaller subset of programs on an "as needed" basis. The Hoffman Geneflow Model (2014) has been used for all segregated steelhead programs in Region 4 and 6 in years 2014 through 2018, to ensure geneflow is <2% to natural populations. All new hatchery programs are also assessed using the AHA/ISIT model or Hoffman Model (segregated steelhead) to ensure that program pHOS or geneflow do not exceed HSRG recommendations. Hatchery plans state the biological assumptions and management practices (based on scientific literature) that are necessary to reduce ecological risks. These actions include but are not limited to releasing fish that are fully smolted, managing the size of fish at release to reduce predation risk, and managing the release date to reduce overlap with natural-origin fish. However, the actual ecological impacts of hatchery programs on natural populations cannot be quantified without empirical data from field studies or utilizing a model such as PCD Risk. From 2010 through 2012, PCD Risk was run for all hatchery programs in Regions 1, 2, and 3. Mitchell Act programs in Region 5 (N=21) used

PCD Risk as part of the BiOp published in 2017. Starting with the Green River HGMP bundle review process, NOAA Fisheries is using the PCD Risk model to evaluate hatchery programs in Regions 4 and 6. In Region 6, hatchery programs in the South Puget Sound and on the Skokomish and Puyallup rivers are slated to be evaluated using PCD Risk in the near future. However, programs on the coast in Region 6 are not required to have HGMPs and there are currently no plans to run the PCD Risk model for those programs at this time.

Hypothesis testing and assumption refinement was intended to occur using data collected from hatchery monitoring and evaluation programs. However, in cases where M & E programs are not adequately funded or present, these assumptions remain untested.

1-5. Have scientific assumptions associated with hatchery program goals been stated? To what degree has the associated RME program been able to test or revise those assumptions in an adaptive management framework?

Metric: Assumptions (AHA/ISIT) by program
Data provider: Eric Kinne/HEAT Unit

Metric	Region						Total
	1	2	3	4	5	6	
# Programs	7	12	3	28	43	66	159
# AHA	7	12	3	22	43	59	146
# PCD Risk	7	12	3	13	21	0	45
# Geneflow	NA	NA	NA	6	0	7	13
Total	14/14	24/24	6/6	41/56	64/86	66/132	215/318
%	100	100	100	73	74	50	68
Assessment							

Recommendation 6: Select an integrated or segregated broodstock management strategy based on population goals and hatchery program purpose

Intent: Selecting a broodstock strategy will determine if the hatchery fish are intended to be genetically similar and interbreed with natural fish or genetically distinct and reproductively isolated from the natural fish.

The critical factors when evaluating this recommendation are assessing how well fish are genetically integrated (i.e., PNI) or segregated (i.e., reproductively isolated in space or time). Because gene flow between hatchery and wild fish will be covered under Guideline 2 Recommendation 8 (i.e., broodstock standards), the emphasis of this assessment will be on segregated programs, or to specifically assess the probability of how well hatchery fish are segregated from wild fish.

Hatchery fish that are released and return to a location with no wild fish (i.e., hatchery rack or terminal area with no natural production) have a high probability of segregation assuming low stray rates. Differential spawn timing (e.g., steelhead) has also been used to minimize the genetic interactions between hatchery and wild fish but is less definitive and must be monitored to ensure segregation is in place through time. However, use of the Hoffman model (see 1-5) has allowed for an assessment of the success of segregation for steelhead programs. Based on data available, apparent mechanisms (i.e., space or time) for a significant portion (33%) of the segregated hatchery programs are not present. A careful reexamination of these programs (N=34) is required to determine the best broodstock management strategy. Furthermore, empirical data from the spawning grounds is also not available to confirm segregation of hatchery and wild fish for most programs (i.e., Chinook is the exception). Hence, the effectiveness of existing mechanisms for segregation is also a concern.

1-6. Are broodstock management strategies (integrated or segregated) consistent with both the population and hatchery program goals?

Metric: Broodstock strategy by program
Data provider: Eric Kinne/ HEAT Unit

Metric	Region						Total
	1	2	3	4	5	6	
Integrated	4	10	2	15	18	44	92
Segregated	3	2	1	14	25	22	67
Space	2	2	1	4	7	9	25
Time	0	0	0	8	11	7	26
Neither	1	0	0	2	5	6	17
%	67	100	100	86	72	73	76
Assessment	○	●	●	●	○	○	●

Recommendation 7: Size hatchery programs based on population goals and as part of an "All H" strategy

Intent: Properly sized hatchery programs meet management goals while minimizing risks to natural fish and other hatchery programs. Program that release too many fish may actually prevent other management goals from being met (e.g., stray rate or pHOS). A standard metric(s) is needed to help evaluate this recommendation that can be used across all conservation or harvest programs.

A properly sized hatchery program would, under average conditions, meet management goals. Programs that fail to meet management goals may be too small or experience higher than expected mortality during some life stage(s). Hatchery survival is addressed under Recommendation 13. As part of this recommendation, we assess if hatchery programs are too

large and thereby pose greater risk to natural spawning populations. WDFW program sizes were evaluated using AHA (see Recommendation 5), but the assumptions in AHA must be tested using empirical data. As AHA was used to assess WDFW programs starting in 2009, only one to two generations of salmon have returned, and data to validate model assumptions has not been sufficient to date across much of the state. Alternatively, we can use other metrics (i.e., stray rates and pHOS) that are more available to infer if program size is too large and poses greater than expected risk. Hatchery programs that exceed pHOS and stray rates goals (i.e., 5%) may be too large or require additional reform actions reduce risk (e.g., improve homing to reduce stray rates).

Stray rates are a surrogate for gene flow rates among independent populations and should not exceed 5% in order to maintain genetic diversity and local adaption of the recipient population. Because measuring gene flow among donor and recipient populations throughout the State is not practical, pHOS or the proportion of hatchery on the spawning ground is used as a surrogate. Unfortunately, consistent accurate and unbiased estimates of pHOS are not available for most populations, except Chinook Salmon, due to the challenge of monitoring during higher flow conditions and inability to externally mark chum, pink and sockeye. However, since we are interested in program specific pHOS levels we must use CWTs instead of a generic mark (i.e. adipose fin-clip). CWT recoveries can be expanded by sample and mark rate data, if available, to estimate the number of hatchery fish from each program on the spawning grounds in a non-target stream. The total number of stray hatchery fish should not be greater than 5% of the spawning population in order to maintain the natural genetic diversity among our populations.

Because the data and resources to conduct this analysis are not available, we estimated stray rates using estimated CWT recoveries based on the brood year (i.e., the year fish were spawned in the hatchery) and not the year in which fish returned to freshwater (i.e., run year). Brood year specific stray rates were calculated by dividing the estimated number of CWTs in non-target streams by the estimated total number of CWTs recovered in freshwater (i.e., net, sport, hatchery escapement, fish traps and spawning grounds). If greater than 5% of the total estimated CWT recoveries were recovered in a non-target stream(s), then the target stray rate would be exceeded. For those programs identified in this assessment, a more detailed stray rates analysis based on run year, as previously described, would be warranted. For hatchery program other than Chinook, alternative methods must be developed to assess stray rates (e.g., genetic introgression, other marks, PIT tags).

Brood year specific Chinook stray rates were summarized for years 2000 through 2011. Based on estimated CWT data, 38% and 33% of the harvest and conservation programs had a mean stray rate greater than 5%, respectively. For these programs a more detailed analysis of both hatchery practices (i.e., increase homing) and spawning ground data is warranted. This analysis only examined single program specific stray rates. A more detailed analysis should encompass strays from all hatchery programs (WDFW and non-WDFW) and the cumulative impact on natural populations.

1-7. Are hatchery releases and harvest goals optimized such that conservation or harvest goals are met but risk to wild fish minimized?

Metric: Conservation programs = % hatchery stray targets are met
Harvest programs = % hatchery stray targets are met

Data provider: Eric Kinne/ HEAT Unit

Metric	Region						Total
	1	2	3	4	5	6	
Programs	2	9	2	9	10	15	47
Harvest	0	4	2	6	9	11	32
Stray rates > 5%	0	2	0	1	4	5	11
Conservation	2	5	0	3	1	4	15
Stray rates > 5%	0	3	0	0	0	2	5
Total	2/2	4/9	2/2	8/9	6/10	8/15	31/47
%	100	44	100	89	60	53	66
Assessment							

Recommendation 8: Manage harvest, hatchery broodstock, and natural spawning escapement to meet HSRG standards appropriate to the affected natural population's designation of biological significance and recovery phase

Intent: Minimizing the genetic risk of hatchery fish on natural populations requires that gene flow between hatchery and natural fish be effectively managed through harvest, broodstock, and the proportion of hatchery fish spawning naturally.

1-8. See Guideline 2 below.

Recommendation 9: Manage the harvest to achieve full use of hatchery-origin fish

Intent: Managing the genetic impact of hatchery fish is most effectively accomplished when all fish are external marked. Selective fisheries can target hatchery fish while minimizing impacts to wild fish.

1-9. See Guideline 4 below.

Recommendation 10: Ensure all hatchery programs have self-sustaining broodstock

Intent: Promote local adaption, thereby maintaining long term productivity and genetic diversity among populations.

Transferring eggs, juveniles or adults among hatcheries is a practice that is becoming less common. A majority of programs (89%) use locally derived broodstock and those that don't

likely lack the infrastructure and ability to consistently collect the required number of broodstock. If resources are not available to make needed improvements, hatcheries could consider reprogramming production to a reliable local broodstock source.

1-10. What percentage of hatchery programs use local (i.e., not imported) collected broodstock, both hatchery and natural origin?

Metric: Broodstock source by program
Data provider: Fish book/Catie Mains

Metric	Region						Total
	1	2	3	4	5	6	
Programs	7	12	3	28	43	66	159
Local	5	11	3	26	36	63	139
%	71	92	100	93	84	89	87
Assessment	●	●	●	●	●	●	●

Recommendation 11: Coordinate hatchery programs to account for the effects of all hatchery programs on each natural population and each hatchery program on all natural populations

Intent: Regional coordination of all hatchery programs among co-managers would ensure the negative ecological impacts on natural or other hatchery populations are minimized. Furthermore, ensure that number of hatchery fish released within a watershed is not in excess of the number needed to meet management goals.

In the Columbia Basin (Regions 1, 2, 3, 5), most programs are mitigation related to the hydro-system (Federal and PUD). Both co-managers (State, tribal and federal) and funding entities manage the programs through various processes (e.g., HCP, LSRCP, YKFP, Mitchell Act). Furthermore, there is little overlap (i.e., multiple programs of same species/race) within a watershed. Ecological interactions among hatchery and wild fish have been assessed using PCD Risk models, and while the majority of impacts are estimated to be within containment objectives, some key assumptions of the model require validation with empirical data. While harvest-related impacts (i.e., direct and indirect mortality) are estimated through various models (e.g., Fishery Regulation Assessment Model or FRAM), mortality associated with negative ecological interactions among juvenile hatchery and wild fish has not been comprehensively evaluated for programs at the watershed scale outside the Columbia River (Pearsons et al. 2012). Genetic assessments are based on the impacts of stray hatchery fish to natural populations, both in and out of the release basin. Region 5 utilized an AHA model with a stray matrix to assess genetic impacts on target and non-target watersheds. For Region 4 and 6 steelhead the proportion of effective hatchery contribution (PEHC), is used to assess hatchery impacts to natural populations. For Chinook spawning ground recoveries of coded-wire tags are used to assess genetic stray impacts. Spawning ground data to conduct stray analyses are not

available for coho, chum, pink and sockeye due to the challenging conditions that prohibit tag recoveries and the inability to tag juveniles.

1-11. To what extent do WDFW hatcheries coordinate with other hatchery programs at the watershed level such that negative ecological and genetics impacts can be monitored and minimized?

Metric: Number of programs (WDFW v. other) by watershed AHA/Stray matrix/PCD Risk/HSRG database or reports

Data provider: Eric Kinne/ HEAT Unit

Metric	Region						Total
	1	2	3	4	5	6	
WDFW	7	12	3	28	43	66	159
Federal		3			5	4	12
Tribal	1	9	5	14	3	29	61
Other				1			1
Total	8	24	8	43	51	99	233
Ecological	8/8	24/24	8/8	15/43	21/51	0/99	76/233
Genetics	8/8	24/24	5/8	22/43	51/51	30/99	140/233
%	100	100	81	43	71	15	46
Assessment	●	●	●	●	●	●	●

Recommendation 12: Ensure that facilities are constructed and operated in compliance with environmental laws and regulations.

Intent: Ensure WDFW facilities do not negatively impact the quality or quantity of habitat in which they operate.

1-12. See Guideline 5 below.

Recommendation 13: Maximize survival of hatchery fish consistent with conservation goals.

Intent: Using best management practices (BMPs) results in maximizing hatchery survival which in turn result in fewer broodstock needed to meet release goals. Releasing the optimal number of juveniles also reduces ecological impacts on natural fish and minimizing broodstock requirements results in more hatchery fish for harvest or natural fish on the spawning grounds (i.e., management goals).

Evaluating which set of BMPs for each hatchery program produces the maximum survival is beyond the scope of the assessment. Alternatively, we used survival-to-adult return (SAR) as a surrogate for BMPs because SAR is ultimately the metric of interest. Hence, the assessment will

examine patterns in SARs, but not be able to determine why observed patterns are present. This approach assumes survival in the hatchery (broodstock, eggs, and juveniles) is not limiting program survival and meets a program standard (i.e., identified in HGMPs or M & E plans), which also need to be examined at a later date.

Data on survival-to-adult return for each program, if available, were compiled to assess the overall and relative survival of hatchery fish across programs and regions (BY 2000-11 Chinook, and Coho; BY 2000-12 steelhead). Hatchery CWT (Chinook, Coho and steelhead), PIT tag (steelhead) or catch based (steelhead) SAR data was available for most programs, and Chinook data were the most complete. Hatchery Chum Salmon survival data is limited to only Lower Columbia Programs. Of the 159 programs in the assessment, 35 (22%) programs had no survival data. Incomplete or lacking survival data from hatchery programs is a direct result of inadequate funding (i.e., funding to tag fish prior to release or recover tags from returning adults). CWTs are often not budgeted into hatchery production with the exception of indicator stocks and mitigation programs, which results in ad-hoc funding that rotates across programs. Additionally, smaller co-op programs rarely include CWT groups are the number of fish released is typically not significant enough to provide a reliable estimate of survival. Survival comparisons were made using only adipose fin-clipped programs. While CWT only programs should have higher SARs because fish escape mark-selective fisheries, undoubtedly some CWTs are missed particularly in Alaskan and Canadian fisheries and not reported because CWT-based SARS are typically 25% lower for adipose present groups compared to adipose fin-clipped groups. When available, comparisons were also made between WDFW and non-WDFW programs. Programs with very incomplete data (<50% years) were not included in comparisons. Because environmental factors may have a strong influence on SAR, programs were grouped by geographic regions. We also examined the variability in SARs within and across geographic regions using the coefficient of variation (CV) of mean program SARs. Higher variability within a geographic region would suggest all programs are not surviving similarly and additional investigation would be required to determine causation.

In general, the expectation is that SARs would be higher as the distance to and from the ocean decreases (i.e., greater migration related mortality). WDFW programs followed this spatial pattern with some notable exceptions below. However, variability in SARs was more similar across all programs suggesting external factors (i.e., ocean conditions) were the important driver, not necessarily hatchery practices. WDFW programs had survival rates equivalent or greater than other non-WDFW programs, although these comparisons were few and were not made in all geographic regions. A more detailed discussion of SARs by program type and species is presented below.

Yearling spring Chinook programs followed this pattern, except for the Upper Columbia where the Chiwawa spring Chinook program had higher than expected survival (Figure 2a). Programs with good survival also had lower variability (Figure 2b). The greatest variability in survival was observed in the lower Columbia. A more detailed examination of these data showed one program had high survival (Cowlitz River), while two programs had very low survival (Deep and Lewis rivers). We are not able to determine if lower survival is due to hatchery practices or

poor CWT recovery data; however, the Deep River program has been discontinued and a release timing study has been initiated to assess survival implications.

Summer/fall Chinook yearling programs had similar SARs except in south (south of and including Green River) Puget Sound (Figure 2c). While important for recreational fisheries in Puget Sound, the two yearling programs had low mean SARs (0.3% and 0.5%) compared to all other programs. Similar to spring Chinook programs, we are not able to determine if lower survival is due to hatchery practices or poor CWT data. Interestingly, all programs in south Puget Sound tend to have lower survival than those in north Puget Sound, suggesting a geographic effect. Variability in SARs across regions is greater than expected (Figure 2d) but may also be influenced by sample size.

Summer/fall Chinook subyearling programs are the most common of WDFW's production programs. SARs followed an expected geographic pattern, except in the lower Columbia and south Puget Sound where survival was lower than expected (Figure 2e). Coastal programs were fully represented only by one program (Forks Creek fall Chinook). The other eight Chinook programs have missing or incomplete CWT data time series, due to a lack of consistent funding for CWTs. Variability in SARs was similar across regions (Figure 2f).

Coho CWTs are either not recovered or expanded for recovery effort (i.e., sample rate) on the spawning grounds due to flow conditions that limit the success of such efforts. CWT SAR data should be viewed as providing an index of survival, but not an estimate of survival. Late run or North Coho generally have lower SARs than normal or South Coho (Figure 3a). North Puget Sound programs, like Chinook, have the highest SARs. SAR variability is more similar than Chinook and negatively correlated with SAR (Figure 3b).

Steelhead CWT or catch based SARs lack spawning ground recoveries, while SARs estimated using PIT tags in the Columbia River may lack fish harvested below Bonneville Dam. Starting in 2010, WDFW creel sampling protocols included scanning fish for PIT tags, but if fish were gutted prior to creel they would still be missed. Hence, steelhead SAR data should also be viewed as an index not an estimate of survival. Summer steelhead tend to have apparent higher SARs than winter steelhead. This phenomenon is likely due to greater harvest rates on summer steelhead due to an earlier freshwater adult run timing and possibly greater by-catch in other commercial fisheries (e.g., Coho and Chum). Which also may result in a greater proportion of winter steelhead escaping to the spawning grounds compared to summer steelhead. If survival rates included a representative sample of hatchery spawners then we would expect survival of summer and winter steelhead to be similar. Steelhead SARs follow the expected spatial pattern except in Puget Sound where juvenile steelhead survival has been identified as an issue (Kendall et al 2017; Figure 4a). Interestingly, variability in steelhead SARs across the State is lower and less variable (Figure 4b) than Chinook or Coho suggesting ocean or migration factors are driving observed SARs.

SAR data on chum, pink, or sockeye is generally lacking. SAR data for Columbia River chum programs (N=3) is being collected, but nowhere else in the state. Due to the juvenile size at

release, standard marking and tagging methods used for SAR evaluations for other species are not possible for these species. While these programs only comprised 11% (18/159) of all programs, even basic hatchery evaluations cannot be performed without survival data. SAR estimates using run-reconstruction data for chum, pink and sockeye programs is currently being explored.

1-13. Are WDFW hatcheries implementing rearing and release strategies that maximize the survival of hatchery fish?

Metric: Survival-to-adult (SAR)
Data provider: Gary Marston

Species	Survival time series	Region						Total	%
		1	2	3	4	5	6		
Chinook[a]	Complete	2	9	2	8	10	6	37	75.5%
	Incomplete				1		9	10	20.4%
	None						2	2	4.1%
								49	
Coho[a]	Complete				4	11	8	23	54.7%
	Incomplete				1		11	12	28.6%
	None				1	1	5	7	16.7%
								42	
Chum	Complete					2		2	15.4%
	Incomplete					1		1	7.7%
	None				1		9	10	76.9%
								13	
Pink	Complete							0	0.0%
	Incomplete							0	0.0%
	None				1		2	3	100.0%
								3	
Sockeye	Complete							0	0.0%
	Incomplete							0	0.0%
	None				2			2	100.0%
								2	
Steelhead[b]	Complete	4	3		8	15	13	43	87.8%
	Incomplete	1		1				2	4.1%
	None				1	2	1	4	8.1%
								49	
All	Complete	6	12	2	20	38	27	105	66.5%
	Incomplete	1	0	1	2	1	20	25	15.8%
	None	0	0	0	6	3	19	28	17.7%
		7	12	3	28	42	66	158	

[a] Incomplete datasets for Chinook and coho are due to a lack of funding to support CWT groups in all years.

[b] Steelhead programs with no data are primarily conservation programs releasing unmarked fish that are not available for harvest.

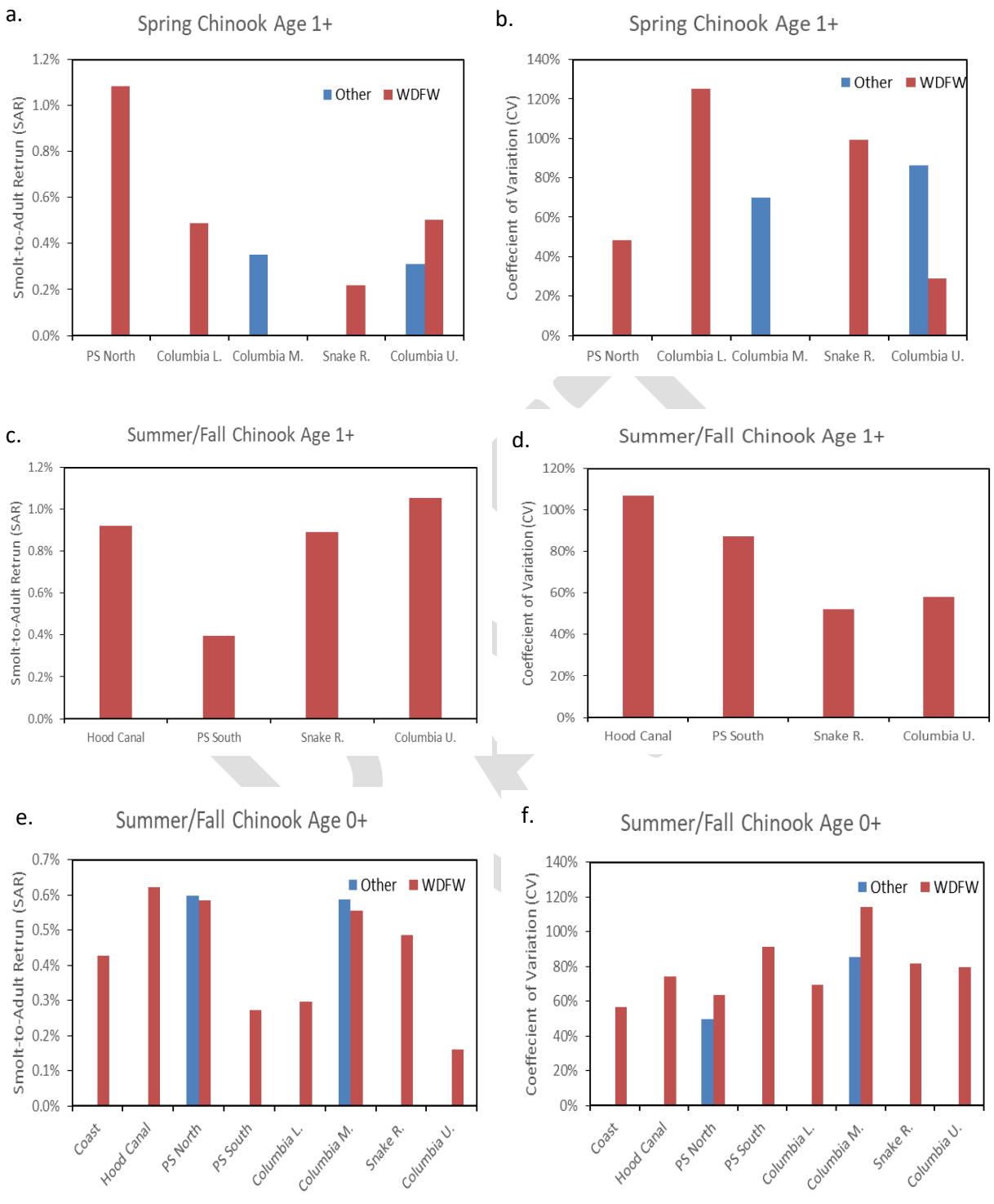

Figure 2. Mean SAR and CV for spring Chinook (a and b), yearling summer/fall Chinook (c and d) and subyearling Chinook (E and f) hatchery programs.

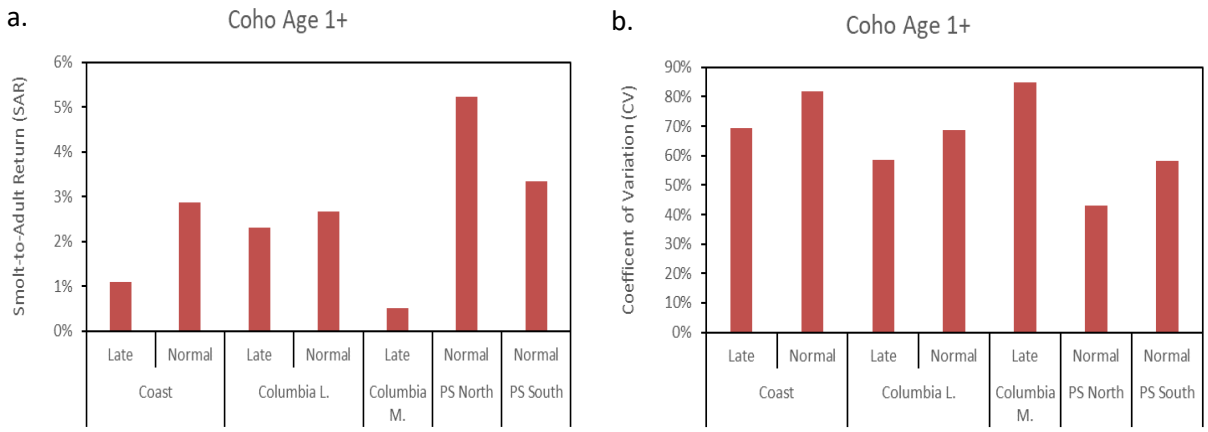

Figure 3. Mean SAR (a) and CV (b) for Coho Salmon hatchery programs.

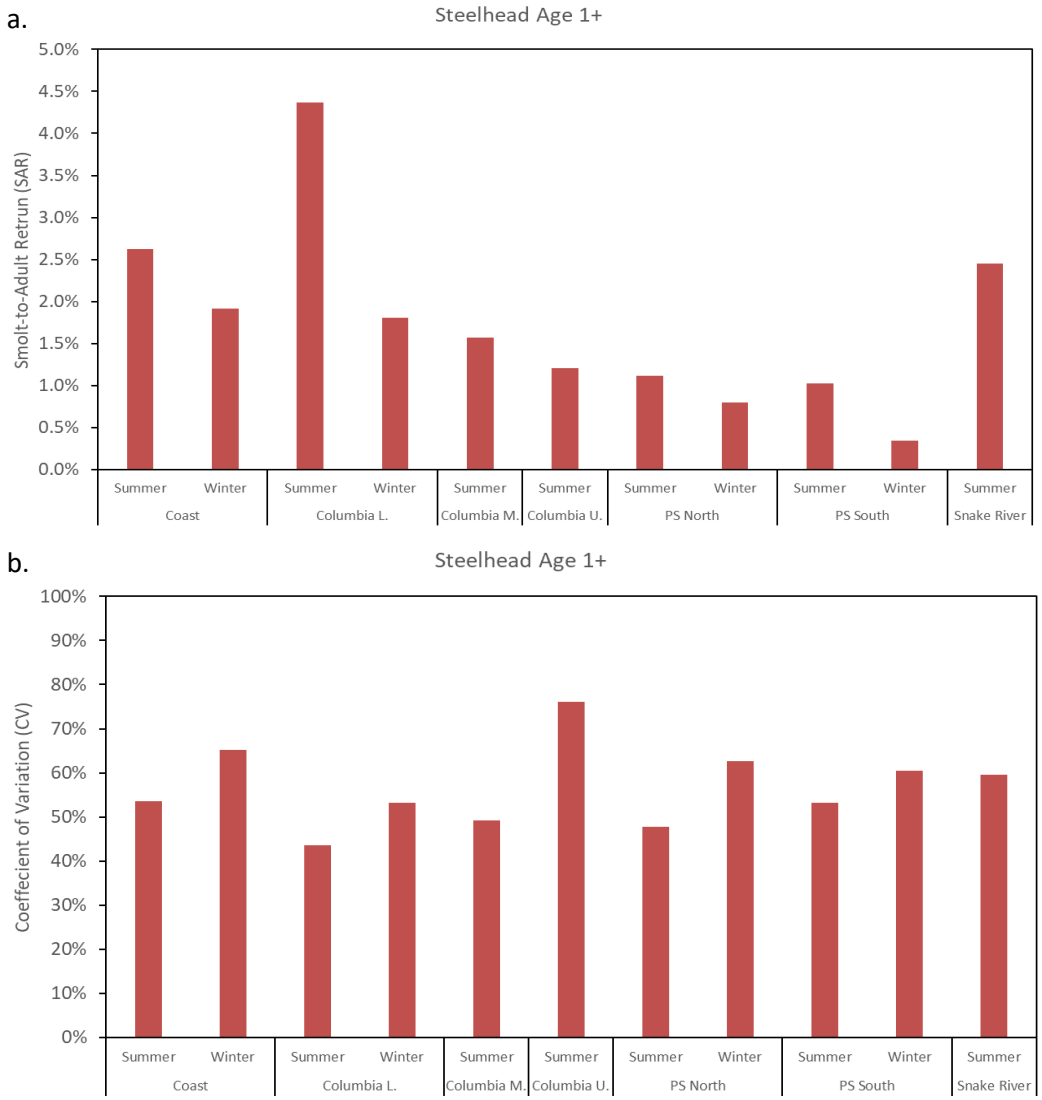

Figure 4. Mean SAR (a) and CV (b) for steelhead hatchery programs.

Principle 3: Monitor, Evaluate and Adaptively Manage Hatchery Programs

Recommendation 14: Regularly review goals and performance of hatchery programs in a transparent, regional, "all-H" context

Intent: Periodically review (e.g., every 5 years) the performance of each hatchery program (broodstock, release numbers, SARs) relative to management goals. Adaptively manage programs in response to hatchery performance and/or other new information (e.g., every 10 years).

1-14. See Guideline 3 below.

Recommendation 15: Place a priority on research that develops solutions to potential problems and quantifies factors affecting relative reproductive success and long-term fitness of populations influenced by hatcheries.

Intent: Improve our understanding of factors (genetic and environmental) responsible for reduced productivity of hatchery fish in the natural environment. Genetic factors may influence the origin composition of broodstock and/or mating schemes. Environmental factors may result in modification of hatchery practices or highlight areas for restoration.

WDFW pioneered some of the earliest research on the relative reproductive success (RRS) of Kalama River steelhead in the 1980's (Lieder et al. 1990). More recently, WDFW has been conducting research on the RRS of Yakima Spring Chinook, Wenatchee Steelhead and Spring Chinook, and Twisp River steelhead. Complete results and conclusions for some of these studies are still pending. A comprehensive review of results for these and other RRS studies is provided in the hatchery reform science review paper (Anderson et al. *in prep*). While these studies have and will contribute to our knowledge of factors responsible for reduced productivity of hatchery fish, they were funded by the Bonneville Power Administration or Public Utility Districts. Hence, implementation by WDFW was limited by numerous factors to include the species/race, population of study, type of hatchery program, duration of study, life stages, and number of generations.

Despite these and other RRS studies, significant gaps in our understanding of the factors responsible for reduced RRS remain. Measuring RRS has been a primary objective of most studies while examining environmental factors have only occurred in some WDFW studies. Additional studies are needed for fall Chinook Salmon, the dominant species (70%) released from WDFW operated hatcheries. No RRS studies have been conducted on sockeye, pink or chum salmon. RRS studies on Coho salmon are also not well represented. More importantly, data on the multigenerational effect (i.e., RRS of natural fish with varying degree of hatchery ancestry) are only now being collected due to the long-time horizon needed for this crucial information, and only for spring Chinook and steelhead. Furthermore, for studies that investigate RRS in populations with a long history of hatchery fish spawning naturally, results may be positively biased because "wild fish" fitness may already be comprised by past genetic

introgression. Overall, additional studies with a greater range of hatchery legacy and better representation of species ecotypes produced by Washington's hatcheries (e.g., fall Chinook subyearling release) are needed to more thoroughly describe RRS patterns.

1-15. Has understanding the factors responsible for reduced relative reproductive success in hatchery fish been a priority for discretionary state funding?

Metric: RRS studies conducted by WDFW and funding source.
Data provider: Andrew Murdoch

Agency	Population	Hatchery influence (# of gen.)	Environmental factors	Multi-generational	Life stage	Funder
WDFW	Wenatchee steelhead	12+	Yes	No	Smolt	CCPUD
WDFW	Wenatchee spring Chinook	3+	Yes	Yes	Smolt Adult	BPA
WDFW	Twisp/Methow steelhead	20+	Yes	Yes	Smolt Adult	BPA/ DCPUD
YN/WDFW	Yakima Spring Chinook	0	No	Yes	Adult	BPA
NOAA/WDFW	Minter Creek Coho Salmon	20+	No	No	Smolt	HSRG
OSU	Hood river steelhead	10+/0	No	Yes	Adult	BPA
NOAA	Imnaha steelhead	3+	No	No	Smolt Adult	BPA
UW	Cedar River fall Chinook	12+	No	No	Adults	NOAA/ PUD
CRITFC	Johnson Creek Spring chinook	0	No	Yes	Adults	BPA
ODFW	Umpqua River Coho Salmon	16+	No	No	Adults	OWEB
Assessment						○

Recommendation 16: Design and operate hatcheries and hatchery programs with the flexibility to respond to changing conditions

Intent: Hatchery facilities and programs must be designed to allow for adaptive management. The inability to respond to either new information or the changing environment will ultimately lead to a hatcheries failure to meet management goals. Developing "adaptive management metrics" is problematic. However, adaptive management is only possible if M & E programs are in place to collect and analysis the necessary data. M & E programs will vary based the purpose of the program, but all should share common metrics.

The WDFW does not have a statewide comprehensive M & E program detailing consistent methodology for all hatchery programs. Basic hatchery data is collected on all programs and reported out using a centralized database (i.e., Fish Books). All Chinook, Coho and steelhead programs that release CWT fish or have sufficient data from other sources are evaluated for trends in survival, fisheries contribution, stray rates, sex composition, and size and age at return. Statewide pHOS, pNOB and PNI levels are evaluated annually, however the methods used to determine pHOS levels are often inconsistent between watersheds. With the exception of pHOS, pNOB and PNI levels, quantitative objectives designed to meet program goals do not exist and a statewide M & E plan establishing consistent methodology would provide a framework to ensure that adaptive management of hatchery programs is feasible.

Comprehensive M & E programs have been developed for most programs in the Columbia Basin because funding was secured as part of the mitigation. However, M & E programs for the Puget Sound and Coast vary from watershed to watershed and are often conducted on a more ad-hoc basis. The Upper Columbia hatchery M & E program is the most comprehensive and include three primary components. Implementation or "in-hatchery" monitoring objectives are intended to evaluate survival rates at multiple life stages, growth rates and release targets. Status and trend or "out-of-hatchery" monitoring objectives are intended to monitor hatchery fish in the natural environment to include post-release juvenile survival, migration timing, size and age at return, adult migration and survival, spawning distribution and spawning success. Lastly, effectiveness monitoring objectives are intended to determine if hatchery programs have statistically met their program goals which require extensive data time series from target and non-target populations. Hatchery programs in the Columbia Basin have several advantages, the most important of which is funding. A persistent lack of funding for State funded hatcheries and population monitoring has greatly impaired our ability to evaluate and adaptively manage these hatcheries.

1-16. Are hatchery monitoring and evaluation programs adequate to inform adaptive management?

Metric: M & E plans by program
Data provider: Alf/HGMPs/Eric Kinne/ HEAT

Metric	Regions						Total
	1	2	3	4	5	6	
Programs	7	12	3	28	43	66	159
Harvest	4	4	3	23	35	55	124
pHOS	3	4	3	8	18	14	50
Conservation	3	8	0	5	8	11	35
pHOS	3	8	0	3	3	3	20
Eff. Mon.	0	8	2	6	3	2	10
S & T mon.	3	8	2	6	3	2	13
Imp. mon.	3	8	2	6	3	2	13
Total*	12/16	36/36	3/3	17/43	30/67	19/99	117/264
%	75	100	100	40	44	19	44
Assessment	●	●	●	●	●	●	●

*Total = # Harvest programs + (# of Conservation x 4)

Recommendation 17: Discontinue or modify programs if risks outweigh the benefits

Intent: Investments must be made to adaptively manage programs such that the benefits outweigh the risks. The inability of implementing adaptive management strategies, for whatever reason, may result in a reduced or discontinued program in order to achieve conservation goals, but at a cost to harvest benefits.

While a formal risk assessment has not been completed for many programs, a large number of hatchery programs have been modified or discontinued in the last 10 years. While it is outside the scope of the assessment to determine why these changes have occurred, the assumption is risks to the natural populations(s) were too great.

1-17. Have risk assessments or other process resulted in modification or closure of hatchery programs?

Metric: Modifications/closures by program (HSRG recommendations)
Data provider: Eric Kinne/ HEAT

Metric	Regions						Total
	1	2	3	4	5	6	
Programs	7	12	3	28	43	66	159
Modified	4	1	1	15	7	9	37
Closed	1	2	0	5	9	6	23
Assessment	●	●	●	●	●	●	●

Guideline 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.

Recommendation 8: Manage harvest, hatchery broodstock, and natural spawning escapement to meet HSRG standards appropriate to the affected natural population's designation of biological significance and recovery phase

Intent: Minimizing the genetic risk of hatchery fish on natural populations requires that gene flow between hatchery and natural fish be effectively managed through harvest, broodstock, and the proportion of hatchery fish spawning naturally.

Segregated programs that failed to meet broodstock standards was due primarily to unknown pHOS levels (N=17) or where pHOS exceeded the standard (N = 8). The majority of integrated programs that did not meet standards were due to low PNI values (N = 19) typically associated with a low pNOB. This is largely associated with the low natural-origin abundance of many natural populations and associated demographic risks of removing too many natural-origin fish from a natural population for broodstock. In some cases, obtaining natural-origin broodstock would be possible with additional funding or staff capacity for in-river broodstock collection efforts. In a few cases pHOS for integrated programs was unknown (N =3). A comprehensive review of spawning ground data, especially for steelhead and Coho, would ensure pHOS values are accurate and updated. Additional funding and development of an M & E program specific to chum, pink and sockeye programs may be required. These programs often have unknown levels of pHOS (N =7) due to a lack of an external mark, difficult sampling conditions insufficient funding, and lack of staff capacity to collect and read otoliths in order to successfully monitor these programs.

Region 5 recently conducted a scientific review of hatchery programs during which staff validated AHA model assumptions and revised a number of the recovery phases associated with the natural populations impacted by hatchery programs. This review resulted in a shift from 86% (36/42) meeting standards to 43% (18/42). One of the largest shifts in this review was a number of programs projected to meeting standard based on the AHA model. During the review, data to validate AHA model assumptions was insufficient for 13 programs, which resulted in these programs being moved from meeting standards to unknown. Where a recovery phase was changed from "recolonization" to "local adaptation" programs shifted from meeting standards to not meeting, which is often the case during a shift in recovery phase due to broodstock standards (pHOS, pNOB and PNI) being applied during the local adaptation phase. It is anticipated that as the program changes associated with the implementation of the Mitchell Act Biological Opinion take effect (installation of additional weirs and program reductions) additional programs will return to meeting broodstock standards. However, additional program changes may be required to ensure compliance with broodstock standards in the future, if improvements are not realized.

2-1. Based on the goal the program and population designation, what proportion of hatchery programs are meeting broodstock standards? (i.e., pHOS standards for segregated programs; PNI standards for integrated programs).

Metric: pHOS for segregated; PNI for integrated
Data provider: Eric Kinne/HEAT

Metric	Regions						Total
	1	2	3	4	5	6	
Segregated	4	2	1	14	25	22	68
Yes	2	2	1	12	9	17	43
No	0	0	0	2[a]	6	0	8
Unknown	2	0	0	0	10	5	17
Integrated	4	10	2	14	18	44	92
Yes	4	9	0	14	9	34	70
No	0	1	2	0	6	10	19
Unknown	0	0	0	0	3	0	3
Programs	8	12	3	28	43	66	160
Standards	6	11	1	26	18	55	117
%	75	92	33	93	43	83	73
Assessment	○	●	○	●	○	●	○

[a] The two programs not meeting broodstock standards are currently being phased out, one will be discontinued and the other is to be converted to an integrated program with a new broodstock source.

Guideline 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 timeline for implementation, strategies for funding, estimated costs including updates to cost figures each biennium.

Recommendation 14: Regularly review goals and performance of hatchery programs in a transparent, regional, "all-H" context.

Intent: Periodically review (e.g., every 5 years) the performance of each hatchery program (broodstock, release numbers, SARs) relative to management goals. Adaptively manage programs in response to hatchery performance and/or other new information (e.g., every 10 years).

WDFW planned to develop Hatchery Action Implementation Plans (HAIPs), to provide a comprehensive review of hatchery operations and hatchery reform actions for all hatchery programs. However, the state and tribal co-managers could not reach agreement with these plans and it was determined that HGMPs, which contain the key information from the HAIPs and are reviewed by the HSRG prior to submission would act as surrogates. Currently 113 of the 116 developed WDFW HGMPs have been submitted to NOAA Fisheries for review.

A Statewide review of hatchery programs broodstock standards (pHOS and PNI) is conducted annually. An assessment of statewide SARs for Chinook, coho and steelhead is conducted every two years, and the Future Brood Document is reviewed annually and summarizes co-manager agreed to release numbers statewide.

Periodic reviews of hatchery programs occur every year in Region 1 (i.e., Lower Snake River Compensation Program) and every five years in Region 2 and 3 (i.e., local PUD funded). Hatchery programs in regions 4, 5, and 6 are reviewed on an ad hoc basis or when new HGMPSs are developed as a part of the formal renewal process (i.e., every ten years) as well as for the annual reports for approved HGMPs. Coastal programs in Region 6 do not require HGMPs and the hatchery plan for Willapa Bay salmon programs is covered in the Willapa Bay Policy and Willapa Bay Salmon Management Plan. However, similar plans that cover hatchery actions in detail have not been developed hatchery programs in Grays Harbor or on the North Coast as the agency priority has been to develop and submit co-manager agreed to HGMPs to NOAA Fisheries to provide ESA take coverage.

3-1. What proportion of WDFW hatcheries are included in action plans or similar comprehensive "All-H" strategic plans that include hatchery reform components, timelines, funding strategies and costs? If so, at what time interval are these plans revisited and revised as part of an adaptive management process?

Metric: HGMPs or Hatchery Plans by Region
Data provider: Eric Kinne

Metric	Regions						Total
	1	2	3	4	5	6[a]	
Programs	9	12	3	31	38	66	159
HGMP or Hatchery Plan	9	12	3	31	38	35	128
%	100	100	100	100	100	53	81
Reviewed	Y	Y	Y	N	N	N	NA
Assessment	●	●	●	●	●	●	●

[a] Coastal hatchery programs do not require HGMPs as stock are not listed under the ESA; hatchery plans for Willapa Bay salmon programs (12) are covered under the Willapa Bay Policy and Willapa Bay Salmon Management Plan; for other coastal programs plans are currently not developed.

Guideline 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.

Recommendation 9: Manage the harvest to achieve full use of hatchery-origin fish

Intent: Managing the genetic impact of hatchery fish is most effectively accomplished when all fish are external marked. Selective fisheries can target hatchery fish while minimizing impacts to wild fish.

Marking data for brood year 2005-2016 including all fish released from WDFW hatcheries for both conservation and harvest purposes including juvenile fish with lower expected survival that were released from co-op or school education programs, which are typically not marked. Additionally, these data include groups of fish not adipose fin-clipped for conversation (i.e., escape MSF) and management (i.e., CWT DIT groups) purposes. Regardless, mark rates peaked in 2012 BY at 94% and have remained above 90% since 2008 (Figure 5).

A summary by region and species found most mark rates during this period exceeded 90%. A closer examination by program found that most instances where adipose fin-clipped fish were not released was due to conservation or management needs or involved fish in excess of release goals (Table 3). The exceptions were in Region 3 and 6 where fish in harvest programs were released without being marked. In Region 6, fall Chinook harvest programs were intermittently not fully marked during the period of interest due challenges with marking challenges at hatchery facilities that have since been addressed. In Region 3, the Priest Rapids

fall Chinook integrated harvest program only marks 47% of the 7.3M release goal with an additional 9% only CWT as part of the DIT group. Over 3M fish are released annually without any external mark, although 100% have been recently otolith marked for M & E purposes. The ACOE pays for 1.7M fish to be reared, marked and released as part of its mitigation. The remaining Grant County PUD mitigation (5.6M) consists of a 600k group paid by GCPUD and 1M fish paid by WDFW. Currently, the Priest Rapids Hatchery Hanford Reach Fall Chinook integrated harvest program remains the only major hatchery program in the Agency with a low mark rate (Table 4). The low mark rate on the Hanford Reach may also be why MSFs have not been implemented increasing the risk to the most important Chinook population in the State.

4-1. Are hatchery programs with harvest goals releasing 100% ad-clipped fish?

Metric: Summary of adipose mark rates by region and species, BY 2008 - 2016

Data provider: Eric Kinne/ Catie Mains

Species (BY 2008-2016)	Regions						Total
	1	2	3	4	5	6	All
Chinook Spring	99%	98%		100%	95%	98%	98%
Chinook Summer		100%		99%		99%	99%
Chinook Fall	97%		67%	99%	99%	91%	91%
Coho Normal		98%		93%	99%	99%	97%
Coho Late					98%	98%	98%
Steelhead Summer	97%	85%	100%	99%	99%	99%	88%
Steelhead Winter				96%	97%	97%	97%
Steelhead Late Winter				27%	92%	99%	91%
Total	97%	97%	68%	98%	98%	93%	92%
Assessment							

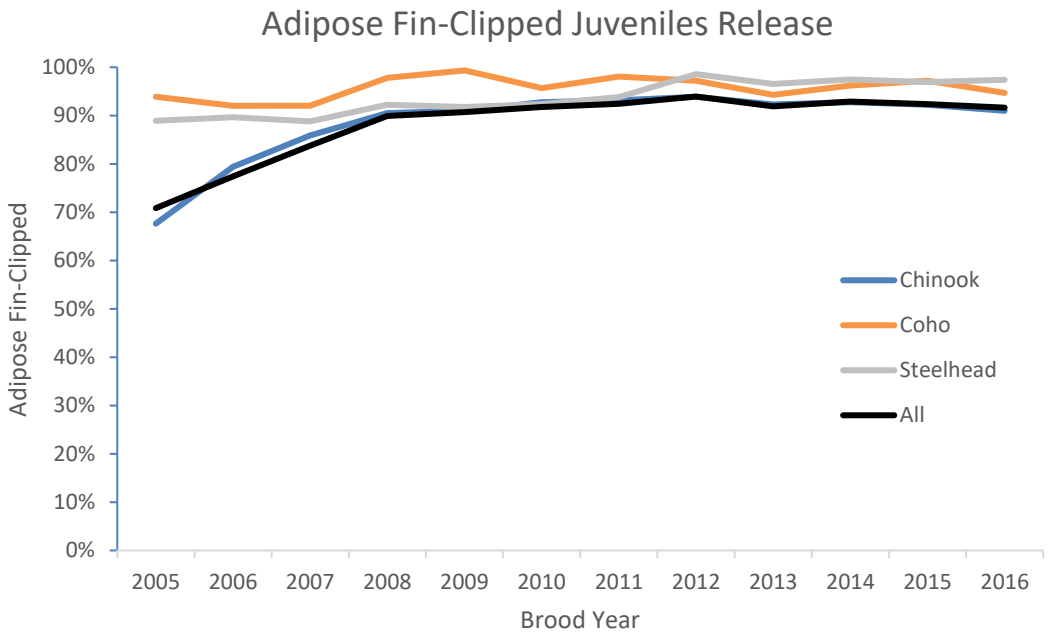

Figure 5. Adipose fin-clip rates by species and overall.

Table 3. Summary of programs by species and purpose that was not 100% adipose fin-clipped.

Region	Species	Program	Purpose
1	Summer Steelhead	Touchet	Conservation
		Tucannon	Conservation
2	Summer Steelhead	Wenatchee	Conservation
		Methow	Conservation
3	Fall Chinook	Priest Rapids	Harvest
4	Coho	Baker Lake	Conservation
	Late Winter Steelhead	Green	Conservation
5	Late Winter Steelhead	Cowlitz	Conservation
		Tilton	Conservation
		Lewis	Conservation
6	Fall Chinook	Elwha	Conservation

Table 4. Summary of Brood Year 2016 marking rates.

Species	Regions						Total
	1	2	3	4	5	6	
Chinook Spring	100%	99%		100%	98%	100%	99%
Chinook Summer		100%		99%		100%	100%
Chinook Fall	79%		69%	98%	99%	96%	92%
Coho Normal				86%	100%	99%	97%
Coho Late					99%	99%	99%
Steelhead Summer	100%	97%	100%	97%	100%	100%	99%
Steelhead Winter				99%	99%	99%	99%
Steelhead Late Winter					93%	100%	96%
Total	88%	99%	70%	96%	99%	97%	92%
Assessment	●	●	●	●	●	●	●

Guideline 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.

Recommendation 12: Ensure that facilities are constructed and operated in compliance with environmental laws and regulations

Intent: Ensure WDFW facilities do not negatively impact the quality or quantity of habitat in which they operate.

WDFW operates 83 hatchery facilities throughout the State. Of which, a majority are in compliance with applicable regulations and has been a major focus of the agency. Capital projects for those facilities not yet in compliance have been identified in current (2019-21) or future (2021-23) biennium budgets. Full implementation of the guideline has been delayed due to lack of State funding as all non-state funded facilities (e.g., PUD or BPA) are in compliance.

5-1. Are all WDFW hatchery facilities in compliance with existing laws and regulations regarding water quality, water quantity and fish passage?

Metric: Compliance by region
Data provider: Eric Kinne/Regional operation managers

Metric	Regions						Total
	1	2	3	4	5	6	
Facilities	8	8	4	17	15	31	83
Passage	NA	NA	NA	17	14	29	60
Water*	7	8	4	12	11	16	58
Pollutants	8	8	4	15	15	31	81
%	94	100	100	86	89	82	87
Assessment	●	●	●	●	●	●	●

* All facilities are in compliance with previous NOAA standards. Data reflect compliance with 2011 standards.

Guideline 6: Implement hatchery reform actions on a schedule that meets or exceeds the benchmarks identified in the 21st Century Salmon and Steelhead Framework.

Intent: Ensure hatchery reform progress is consistent with benchmarks identified in the 21st Century Salmon and Steelhead Framework.

In 2009, WDFW developed and adopted a strategic integrated management framework designed to support and assist the recovery of ESA listed species using an "All- H" approach. A timeline with benchmarks were identified to measure progress towards meet recovery goals and sustainable fisheries. A crosswalk between 2020 benchmarks and policy guidelines indicated redundancy in the implementation assessment (Table 5). Because 2020 benchmarks are incorporated, partially or completely, in other guideline assessments, an independent assessment of this guideline was not conducted.

Table 5. A crosswalk of hatchery reform 2020 benchmarks and other policy guidelines.

Category	2020 Benchmark	Policy Guideline
Wild Fish Populations	100% of biennial hatchery actions implemented	9
Habitat	100% of WDFW-owned structures provide adequate fish passage in non-forestlands.	5
Habitat	Toxic materials are replaced in 50% of high priority structures.	5
Fisheries Harvest	50% of Washington hatchery programs are operated, managed, and evaluated to achieve fishery and population conservation objectives.	1,2,3

6-1. Has the implementation of hatchery reform actions occurred on schedule that meets or exceeds the benchmarks identified in the 21st Century Salmon and Steelhead Framework?

Metric: Progress towards Benchmarks in 2020
Date provider: Eric Kinne/HEAT Unit

Assessment	○

Guideline 7: Provide an annual report to the Fish and Wildlife Commission on progress of implementation.

An annual report that summarizes and tracks implementation of the policy guidelines was to be provided to the FWC. Based on the guidance of the FWC, the preferred reporting format was a

power point presentation and while the policy was adopted in November 2009 and the first report was provided to the FWC in December 2012. The primary focus of the presentations to the FWC was progress towards broodstock management. While these presentations were not comprehensive or provided annually, in part due to the complexity of implementation and lack of staff capacity or FWC availability, they also included important updates on the latest science in which some of the most important concepts of hatchery reform were founded (i.e., genetic fitness models and effects). In addition to the FWC presentations, progress towards meeting broodstock standards statewide has been tracked on an annual basis since the Policy was implemented and reported in the State of Salmon in Watersheds report every two years.

7-1. Did WDFW provide an annual report to the Commission on hatchery reform implementation?

Metric: Reports by year
Data provider: Eric Kinne/HEAT Unit

Guideline	2011	2012	2013	2014	2015	2016	2017	2018	Overall
Assessment									

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

WDFW has invested considerable resources ($8M) in the development, testing and implementation of alternative selective gear type (tangle nets, purse and beach seines). Pounds nets are still being evaluated and have not been implemented. Full implementation of alternative selective gear, except spring Chinook tangle nets, has not occurred for several fundamental reasons:

1. The abundance of hatchery fish and ESA take limits must be great enough to justify the financial investment of commercial fishers (Table 6).
2. Higher than desired post release mortality rates (Table 7) required the mark rate of target species (including non-target species) to be higher than the mortality rate.
3. Certain gear types (e.g. beach seines) require habitat that is limited in Zones 1-5.

Table 6. Total number of hatchery fish harvested using alternative gear in Columbia River commercial fisheries.

Year	Number of fish harvested		
	Spring Chinook[1]	Fall Chinook[2]	Coho[3]
2005	5,189		
2006	4,389		
2007	2,950		
2008	5,702		
2009	4,168		
2010	9,041		
2011	4,524		
2012	6,118		
2013	2,185		4,831
2014	4,000	2,794	19,034
2015	7,211	2,993	1,580
2016	3,613	1,115	604
2017	0	0	0
2018	0	0	0
Total	59,090	6,902	21,218

[1] Tangle nets

[2] Combination of beach and purse seines

[3] Combination of tangle nets and seines

Table 7. Summary of post-release mortality rates associated with alternative fish gear.

Species	Alternative Gear Type			
	Tangle Net	Purse Seine	Beach Seine	Pound Net
Spring Chinook[1]	14.7%/31%	21%	33%	
Fall Chinook		21%	33%	0.5%
Coho	23.6%/54%	29%	38%	
Steelhead[2]	18.5%/23.6%	2%	5%	5.6%

[1] Columbia River/Coast

[2] Spring/fall seasons

8-1. Has the development and implementation of alternative fishing gear types resulted in more hatchery fish caught and reduced indirect mortality on wild or non-target species?

Metric: Number of fish caught and indirect mortality rates
Data provider: Tim Sippel/Ryan Lothrop

Task	Assessment
Develop alternative fishing gear	
Promote alternative fishing gear	
Implement alternative fishing gear	
Assessment	

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

The total cost of implementing the policy has not been estimated. Data has been complied that corresponds with the expenditures related to hatchery and fishery reform actions, not the requested amounts. Depending on the funding source, projects are prioritized in a variety of ways. Funding for policy implementation has primarily came from the State (General Fund) and the Pacific Coast Salmon Recovery Fund (PCSRF). The Columbia River Salmon and Steelhead Endorsement Fund (CRSSE) funded a large expansion of MSFs in the Columbia Basin, the future of which is uncertain because that fund was not reauthorized. The development and implementation of alternative commercial gear was primarily funded through the Mitchell Act. While over $97M has been used to implement the policy, full implementation is not complete and the effectiveness of some actions is unknown. While WDFW has been very successful in obtaining additional funding for specific reform actions, lack of funding to evaluate the performance of hatchery and fishery reform actions is a common and well documented problem with habitat restoration projects (Katz et al. 2007; Roni et al. 2008), the other primary tool employed by managers to improve the status of fish populations.

9-1. Have the funding level and sources for implementing hatchery reform actions or selective fisheries increased?

Metric: Funding by source by year
Data provider: Eric Kinne

BN	Year	Hatchery Reform			Fishery Reform			Total
		GFS	PCSRF		Mitchell Act	CRSSE	PCSRF	
2007	2007	$0	$845,260			$0	$209,888	$1,055,148
	2008		$0			$0	$366,966	$366,966
2009	2009	$1,365,330	$3,398,953			$0	$0	$4,764,283
	2010		$1,746,821		$5,331,000	$291,009	$2,138,129	$9,506,959
2011	2011	$2,120,860	$5,263,277			$1,017,002	$1,276,678	$9,677,817
	2012		$1,466,172		$2,650,000	$1,412,962	$749,441	$6,278,575
2013	2013	$13,119,501	$998,504		$3,662,000	$1,869,024	$685,000	$20,334,029
	2014		$2,244,666			$1,772,259	$1,120,460	$5,137,385
2015	2015	$3,773,122	$1,230,796			$1,588,403	$1,019,291	$7,611,612
	2016		$1,409,448			$1,727,695	$789,283	$3,926,426
2017	2017	$24,433,667	$676,919			$1,734,530	$84,035	$26,929,151
	2018					$1,485,833		$1,485,833
Total		$44,812,480	$19,280,817		$11,643,000	$12,898,717	$8,439,172	$97,074,186
Assessment								○

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

In 2010, WDFW developed a draft definition for the "full implementation" of mark-selective fisheries (MSF) and a process for identifying candidate MSFs. While the definition was not officially adopted or an implementation plan developed, the number of Chinook and Coho MSFs implemented when policy C-3619 was adopted in 2009 (N = 13) reached a peak of 39 in 2016 (Figure 6). Not included are two Chinook sport MSFs that were identified (Grays Harbor and Green River), but not implemented. In total, WDFW has identified 15 Coho and 33 Chinook MSFs, of which a majority (85%) are sport MSFs (Figure 7). Since 2009, WDFW has identified or implemented 5 Coho (2 commercial and 3 sport) and 16 Chinook (2 commercial and 14 sport) MSFs.

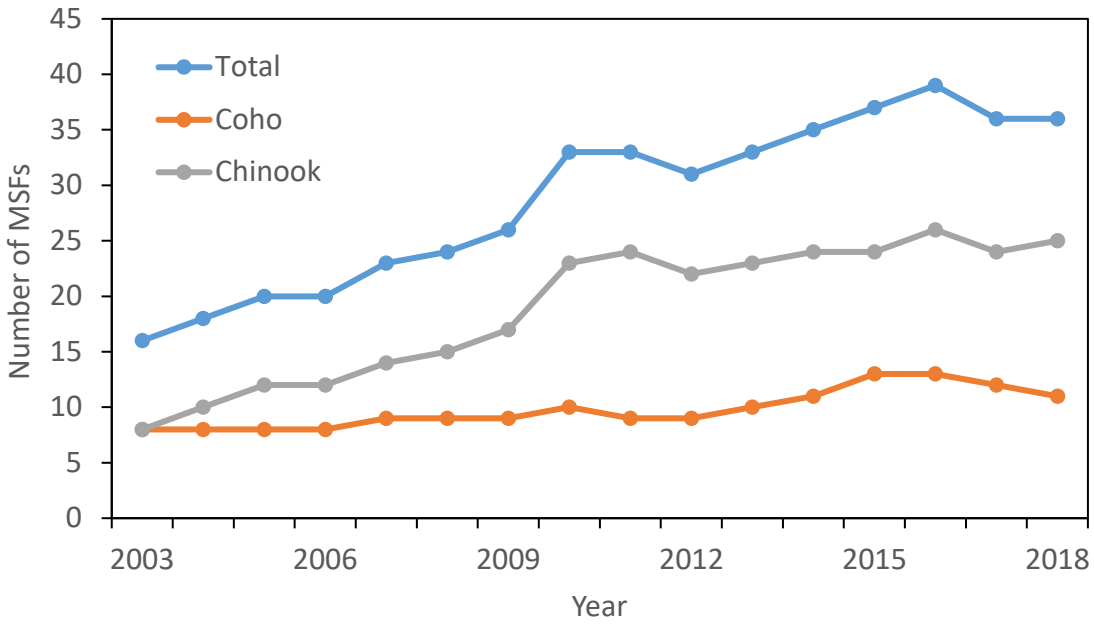

Figure 6. Implementation of Chinook and Coho MSFs in Washington State, 2003 – 2018.

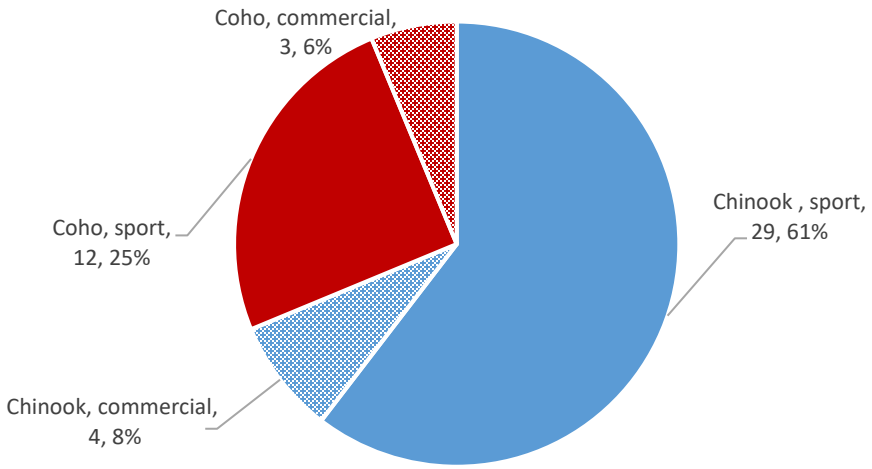

Figure 7. Composition of Chinook and Coho MSFs identified by WDFW.

10-1. Has the full implementation of mark selective fisheries (MSF) been defined and implemented across the State?

Task	Assessment
Define “full implementation”	○
Develop implementation plan	○
Guideline 10	○

Guideline 11: Work with tribal co-managers to establish network of Wild Salmonid Management Zones (WSMZ) 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.

Across all six anadromous salmonid species with associated hatchery programs, 26 major genetic groups and 53 major population groups or strata have been identified. WDFW has officially recognized 7 steelhead populations as WSMZs (Table 8). Many candidate (i.e., no recent or current hatchery program) populations exist, but require agreement from co-managers. In the Puget Sound region, the PSHAAC provided suggestions on WMSZs for all species (PSHAAC 2013) and the Puget Sound Steelhead Advisory Group (PSSAG) has worked to identify additional WSMZs for steelhead, however further co-manager discussion is required to get these officially designated. In some instances, opportunities may exist to develop additional WMSZs (i.e., close hatchery programs if underperforming or if production can be moved, such as was done for the steelhead WSMZs in the Gray/Chinook and EF Lewis Rivers). A single Chinook WMSZ was designated with the Willapa Bay Policy in the North River, which has not received hatchery fish since 1992. While the concept of the WSMZs may be controversial and difficult to attain co-manager agreement on, these populations can potentially serve multiple functions. Reference or control populations for effectiveness monitoring for both hatchery and habitat related actions is a critical function for which there is no substitute. The ability to account for the natural annual variability in fish population responses allows for more precise and timely assessments of management action effectiveness. If hatchery programs are closed, monitoring the de-domestication or re-naturalization of fish populations will provide much needed information of the long-term effects of hatchery programs on the productivity of wild fish.

11-1. Have WSMZs been establish in every MPG for each ESU/DPS for each species across the State?

Metric: WSMZs by MPG by species
Data provider: Eric Kinne/FRPMs

	Chinook	Coho	Steelhead	Sockeye	Pink	Chum	All
# MPG	18	6	16	5	2	6	53
#WSMZ	1	0	7	0	0	0	8
%	6	0	44	0	0	0	15
Assessment	🔴	🔴	🟡	🔴	🔴	🔴	🔴

Table 8. WSMZ by species, ESU or DPS, and MPG or strata.

Species	ESU/DPS	MPG	WSMZ
Steelhead	Coast	Olympic Peninsula	Sol Duc
		South Coast	Grays/Chinook
	Puget Sound	Northern Cascades	
		Central and South Cascades	Nisqually
		Hood Canal/Strait of J de F	Elwha
	Lower Columbia	Cascade Winter Run	NF Toutle & EF Lewis
		Cascade Summer run	EF Lewis
		Gorger Winter run	
		Gorge Summer run	Wind
	Middle Columbia	Walla Walla/Umatilla	
		Yakima	
		John Day	
		Cascade Eastern Slope	
	Upper Columbia	Upper Columbia	
	Snake River	Lower Snake	
		Grande Ronde	
Chinook	Coast	Coast	North River
	Snake River	Spring Lower Snake	
		Spring Grande Ronde/Imnaha	
	Upper Columbia	Spring Upper Columbia	
		Summer/fall Upper Columbia	
	Middle Columbia Spring	Spring Middle Columbia	
		Fall Middle Columbia	
	Lower Columbia	Spring Cascade	
		Spring Gorge	
		Fall Coastal	
		Fall Cascade	
		Fall Gorge	
		Late fall Cascade	
	Puget Sound	Strait of Georgia	
		Strait of Juan de Fuca	
		Hood Canal	
		Whidbey Basin	
		Central/South Basin	
Chum	Columbia River	Coast	
		Cascade	
		Gorge	
	Summer-run Hood Canal	Summer-run Hood Canal	
	Puget Sound/Strait of Georgia	Puget Sound/Strait of Georgia	
	Pacific Coast	Pacific Coast	
Coho	Lower Columbia	Coast	
		Cascade	
		Gorge	
	Southwest Washington	Southwest Washington	
	Olympic Peninsula	Olympic Peninsula	
	Puget Sound/Strait of Georgia	Puget Sound/Strait of Georgia	
Sockeye	Columbia River	Wenatchee	
		Okanogan	
	Baker River	Baker River	
	Quinault Lake	Quinault Lake	
	Lake Pleasant	Lake Pleasant	
Pink	Even Year	Even Year	
	Odd Year	Odd Year	

SUMMARY

Since Policy #C-3619 was adopted in 2009, WDFW has made some major strides towards implementation. The Puget Sound Hatchery Action Advisory Committee ran from 2011 to 2013 and developed population designations (Primary, Contributing and Stabilizing) and recommended wild salmonid management zones (WSMZs) for all species as well as recommending implementation strategies to reduce risk to naturally spawning populations. This included developing a two-stage integration program for Green River fall Chinook salmon, which was implemented in 2014 (PSSAAC 2013). For segregated steelhead programs, all off-station releases where trapping sites are not available have been eliminated and the use of out DPS steelhead stocks have been discontinued in the lower Columbia River and are being phased out in Puget Sound. Additionally, WDFW has developed a genetic method to evaluate gene-flow from hatchery steelhead to natural steelhead populations and developed an M & E plan for Puget Sound steelhead. The ABC broodstock collection program in the Hanford Reach of the Columbia River has utilized anglers to collect natural origin broodstock for the Priest Rapids Fall Chinook program, allowing it to meet its pNOB goals in recent years. Furthermore, alternative commercial fishing techniques have been developed and evaluated while MSF recreational fisheries were executed in several rivers and marine areas (Puget Sound, Washington coast) for the first time since fish were listed under ESA. Reforming WDFW hatchery programs and fisheries has been an ongoing process since before the HSRG was formed (i.e., adaptive management). A comprehensive list of actions is provided in Appendix C.

Despite this enormous investment in our hatchery infrastructure, no salmon populations have been delisted and harvest opportunities remain constrained. The benefits and risks of WDFW hatchery programs have not been quantified, and as a result, adaptive management (i.e., reform actions) has been more reactive than prescriptive. A statewide hatchery monitoring and evaluation program would provide the framework from which the risks and benefits could be quantified and results compared regionally or across the State. Given the complexity of the salmon life cycle and associated natural variability, high quality data (i.e., unbiased and precise) collected consistently at multiple life stages in both the hatchery and natural environment is required. Similarly, a robust analytical framework designed to answer specific questions, but flexible enough to test alternate hypotheses is needed and would greatly assist in prioritizing and evaluating future reform actions.

Lastly, while the benefits of hatchery programs are often debatable, depending on the person asking the question, an overlooked and underappreciated benefit is time. In some cases, hatchery fish have been spawning naturally for over 100 years, yet naturally produced salmon and steelhead are still present. Hatchery programs provide time for resource managers to identify, prioritize and correct life stage survival bottlenecks that are responsible for depressed naturally produced fish abundance. WDFW operates 35 conservation hatchery programs because these populations are depressed and required human intervention in order to prevent further decline and eventually extinction. But what specific actions are needed to address the 35 population survival bottlenecks that necessitated the need for the hatchery program? If hatchery fish are subjected to the same survival bottleneck as naturally produced fish, should

we realistically expect a population level response? Research results suggest no (Vendetti et al. 2018). Time afforded by hatchery production (i.e., reduced probability of extinction) requires, at a minimum, a critical evaluation of the likelihood for significantly improving survival and capacity in spawning, rearing and migratory habitats through habitat restoration. Without such assessments, potential risks from hatchery fish to natural populations will persist. Furthermore, determining if population limiting factors cannot be improved through management actions would assist in prioritizing resources for populations where it is feasible.

As related to salmon recovery, a similar paradigm shift is needed for habitat restoration and harvest reform. Population specific integrated action plans (i.e., any of the 4H's that are applicable) would use data collected as part of the hatchery monitoring and evaluation plan to develop and prioritize specific actions (i.e., other than hatchery related actions). Similarly, under this new paradigm, the effectiveness of hatchery, habitat and harvest actions would be quantified as part of the monitoring and evaluation program. Ultimately, hatchery conservation programs could be transitioned into integrated harvest programs or simply closed.

Recommendations

Assessing the effectiveness of hatchery programs in meeting their program goals is a critical for an adaptive management approach. A general set of recommendations is provided, based on gaps identified during implementation assessment, with a goal of conducting program-specific performance evaluations when complete. These recommendations are not exclusive.

1. **Develop a statewide hatchery monitoring and evaluation program** – A hatchery monitoring and evaluation (M & E) program provides the framework for hypothesis testing, a requirement in order to determine if programs are meeting their goals. A comprehensive program could include objectives for life stage-specific performance in both the hatchery and natural environments, define the metrics and data collection methods, and describe the analytical methodology to be used for each objective. Ideally, the M & E program would be compatible with existing programs (e.g., Upper Columbia and Lower Snake) and adopted by or compatible with all hatchery operators in the State (state, tribes, federal, PUD, and private).

2. **Establish clear concise program-specific quantitative goals** – Program goals, by definition, is how success will be measured. Harvest program goals may simply reflect the current or a future desired number of fish to be harvested. Because harvest goals may be multifaceted (i.e., tribal, sport, and commercial), goals should be fishery specific. Conservation goals may also be multifaceted (i.e., delisting/recovery or healthy and harvestable), but also need to take into account the current status of natural origin fish abundance and productivity, current habitat condition and capacity, current and potential for climate change impacts, and possibly most importantly, the likelihood that life stage survival bottlenecks currently impacting the population will be corrected.

3. **Assess current population viability** – If phases of recovery and associated triggers are to be used to guide hatchery program goals through time, a scientifically defensible

framework for assigning population recovery phases and triggers must be developed. Population viability models (PVA) represent a possible approach. However, for populations that lack a good time series of spawner-recruit data, other less data intensive approaches may need to be developed in the interim.

4. **Establish more wild salmonid management zones** – Co-manager agreement to wild salmonid management zones (WSMZ) for all species may result in reduced harvest opportunity if production cannot be shifted to another watershed. While the concept of WSMZs may be controversial, the data from these populations is critical in evaluating the effectiveness of hatchery programs in other populations. In general, determining the effectiveness of hatchery programs involves long time series of data that include considerable environmental variability (e.g., changing ocean conditions). Data from populations without hatchery fish can be used to control for this environmental variation, thereby increasing the likelihood of detecting an effect of the hatchery program. Data from these populations should be collected using similar methods and scientific rigor.

5. **Improve spawner abundance estimates** – Unbiased estimates of spawner abundance, both hatchery- and natural-origin, is required to evaluate and adaptively manage our hatchery programs. When carcasses are used to estimate hatchery abundance, carcass samples must also be representative and unbiased. Spawner abundance estimates are also critical for assessing population productivity and ultimately viability. In cases where unbiased and precise estimates of spawners are not available (i.e., logistical and/or financial reasons), the use of index or surrogate measures of abundance may be required, but the associated uncertainty in these indirect measures of abundance must also be incorporated into the estimate.

6. **Conduct a multigenerational relative reproductive success study on fall Chinook** – In 2016, 70% of all hatchery releases from WDFW facilities were fall Chinook. Relative reproductive success (RRS) studies conducted to date do not adequately represent the fall Chinook hatchery programs. The study design should have the ability to isolate genetic from environmental effects by comparing the reproductive success of naturally spawning hatchery-origin fish of different degrees of hatchery ancestry (NN, HN, and HH crosses), and by comparing naturally spawning natural-origin fish of different degrees of hatchery ancestry (NN, HN, and HH crosses). The multi-generational nature of the project will provide information as to the long-term fitness implications of hatchery fall Chinook spawning naturally, a phenomenon that has been occurring for decades in some populations.

7. **Develop study designs for reform action effectiveness prior to implementation** – All reform actions cannot or should not be evaluated for effectiveness for numerous reasons (e.g., cost, logistics, or scientific uncertainty). However, some reform actions result in a reduction in hatchery fish abundance that may be viewed in direct opposition to other WDFW goals (i.e., provide sustainable fishing). If the scientific uncertainty

associated with a specific type of hatchery reform action lacks empirical data, then a study design -- including a power analysis is to estimate the detectable difference and how to monitor -- should be developed prior to implementation. As previously discussed, without a complete study design *a priori*, determining the effectiveness of specific reform actions will be problematic.

8. **Reexamine program-specific coded wire tagging rates** – Coded wire tags (CWT) are how most hatchery fish are assigned to a program (i.e., harvest, hatchery returns, and spawning grounds). Inadequate CWT tagging programs may lead to biased and imprecise estimate of hatchery fish abundance. Increasing CWT rates may also be a more cost-effective approach to improving data quality rather than increasing sample rates (i.e., the proportion of catch sampled).

References

Busack, C., K. Currens, T. Pearsons and L. Mobrand. 2005. Tools for evaluating ecological and genetic risks in hatchery programs, 2004 Final Report, Project No. 200305800. Bonneville Power Administration, Portland, Oregon 91 p.

Ford, M. J. 2002. Selection in captivity during supportive breeding may reduce fitness in the wild. Conservation Biology 16:815–825.

Hoffmann, A. 2017. Estimates of gene flow for select Puget Sound early winter steelhead hatchery programs. Washington Department of Fish and Wildlife. Unpublished report, Montesano, WA.

HSRG. 2017. Implementation of hatchery reform in the context of recovery planning using the AHA/ISIT tool. Hatchery Scientific Review Group prepared for Washington Department of Fish and Wildlife, Olympia, WA.

Lieder, S. A., P. L. Hulett, J. J. Loch, and M. J. Chilcote. 1990. Electrophoretic comparison of the reproductive success of naturally spawning transplanted and wild steelhead trout through the returning adult stage. Aquaculture 88:239–252.

Pearsons T.N. and C.A. Busack. 2012 PCD Risk 1: a tool for assessing and reducing ecological risks of hatchery operations in freshwater. Environmental Biology of Fishes 94:45-65.

WDFW. 2013. Puget Sound Hatchery Action Advisory Committee final report. Washington Department of Fish and Wildlife, Olympia, Washington.

Vendetti, D. A., R. N. Kinzer, K. A. Apperson, B. Barnett, M. Belnap, T. Copeland, M. P. Corsi, and K. Tardy. 2017. Effects of hatchery supplementation on abundance and productivity of natural-origin Chinook salmon: two decades of evaluation and implications for conservation programs. Canadian Journal of Fisheries and Aquatic Sciences. DOI: 10.1139/cjfas-2016-0344.

DEFINITION OF TERMS

Best Management Practices (BMP): Hatchery practices that promote the health and survival of hatchery fish in both the hatchery and natural environments while minimizing the potential ecological and genetic risks to natural origin fish.

Conservation Hatchery Programs: Artificial production programs intended to have a net aggregate benefit for the diversity, spatial structure, productivity, and abundance of the target natural population.

Distinct Population Segment (DPS): A listable entity under the Endangered Species Act (ESA). The ESA provides for listing species, subspecies, or distinct population segments. A population is considered distinct under the ESA if it is discrete from other populations of its species in terms of physical, behavioral, or genetic characteristics, occupies a unique ecological setting, or its loss would represent a significant gap in the species' range (NMFS 2015).

Evolutionarily Significant Unit (ESU): A population or group of populations of Pacific Salmon that is substantially reproductively isolated from other conspecifics populations and represents an important component of the evolutionary legacy of the species (NMFS 2015).

Harvest Programs: Artificial production programs intended to provide fishery benefits.

Hatchery-origin: Fish whose parents were spawned in a hatchery. Typically identified by a mark, often an adipose fin clip.

Hatchery Genetic Management Plan (HGMP): A plan describing all operational aspects of a hatchery program that provides endangered species act permit coverage under the U.S. Endangered Species Act.

Integrated Program: In an integrated program, hatchery and natural populations are two components of a single population. The intent of an integrated program is for the natural environment to drive the adaptation of the combined hatchery-natural population. This is accomplished by using natural-origin fish for a portion of the broodstock and by limiting the proportion of hatchery fish spawning in the wild. The intent is to minimize genetic divergence between the hatchery and natural populations. The purpose of an integrated program may be to contribute to conservation and/or harvest goals. A hatchery program is integrated with one specific natural population.

Natural or natural population: Used broadly to refer to populations inhabiting the river or natural environment. Natural populations are the targets for recovery of Evolutionary Significant Units listed as threatened or endangered under the U.S. Endangered Species Act. In many cases, natural populations have ongoing intentional or unintentional demographic exchange with a geographic proximate hatchery populations and as a result, are genetically indistinguishable from said proximate hatchery population.

Natural-origin or naturally spawned: Fish whose parents spawned in the river or natural environment. Natural-origin fish may have one or two hatchery-origin parents that spawned naturally. Natural-origin fish can and are spawned themselves in hatcheries.

Naturally spawning: Fish that reproduce in the river or natural environment, regardless of whether they are natural-origin or hatchery-origin. Hatchery-origin fish can and often do spawn naturally in the river.

Phases of Recovery: The conservation phase of a natural population, defined by the HSRG, based on its viability and habitat conditions. The four phases are preservation, recolonization, local adaptation and full recovery.

> Preservation: The primary objective in the preservation phase is to prevent extinction and preserve the genetic diversity of the population. Suitable for populations with low abundance where the habitat is unable to support a self-sustaining population.
>
> Re-colonization: The objective in the re-colonization phase is to re-populate suitable habitat. Suitable once the population is no longer at risk of extinction and when underutilized habitat is available to re-colonize.
>
> Local Adaptation: In the local adaptation phase, the objectives are to meet and exceed the minimum viable spawner abundance for natural origin spawners, and increase population fitness, reproductive success, and life history diversity through local adaptation (e.g., achieved by reducing hatchery influence by maximizing PNI). This phase is reached when specific population triggers are met, and the habitat is capable of supporting abundances that meet these population objectives.
>
> Full Restoration: In the full restoration phase, the goal is to maintain a viable population as defined by the viable salmonid population attributes. This phase is reached when specific population triggers are met, and the habitat is fully restored and protected.

Population Designations: Defines the biological significance of natural populations as primary, contributing or stabilizing.

> Primary populations: Natural populations targeted for restoration to high (95-99% probability) or very high (> 99%) viability. These populations are the foundation of salmon recovery. Primary populations are typically the strongest extant populations and/or those with the best prospects for protection or restoration. These typically include populations at high or medium viability during the listing baseline.
>
> Contributing populations: Natural populations for which some improvement will be needed to achieve a stratum-wide average of medium viability (75 – 94% probability). Contributing populations might include those of low to medium significance and viability

where improvements can be expected to contribute to recovery. Varying levels of improvement are identified for contributing populations. Some contributing populations are targeted for substantial improvements whereas more limited increases are identified for others.

Stabilizing populations: Natural populations maintained at baseline levels. These are typically populations at very low viability during the listing baseline. Stabilizing populations might include those where significance is low, feasibility is low, and uncertainty is high. While stabilizing populations are not targeted for significant improvement, substantive recovery actions will typically be required to avoid further degradation.

Proportion of Hatchery Origin-Spawners (pHOS): Percent (%) of naturally spawning fish that are hatchery-origin.

Proportion of Natural Origin Broodstock (pNOB): Percent (%) of hatchery broodstock that are natural origin

Proportionate of Natural Influence (PNI): pNOB/(pNOB+pHOS)

Recovery: Used generically to refer to improvements in natural population status that would lead to eventual removal from the U.S. Endangered Species List. "Salmon recovery" also refers to a broad suite of habitat, hatchery, and harvest actions intended to improve salmon population status towards the goal of de-listing.

Relative Reproductive Success (RRS): Comparison of the number of offspring produced by hatchery-origin and natural-origin fish; used as a measure of fitness.

Segregated Program: A hatchery-adapted population that is genetically distinct from all natural populations with which it might interact. Only hatchery-origin fish are used in the broodstock. The intent is to maintain a gene pool that is separated from all natural populations. Genetic and ecological risks to the natural population are minimized by limiting pHOS and strays. The purpose of a segregated program is typically to contribute to harvest goals

Smolt to Adult Returns (SAR): Survival rate from release as smolts to return as adults to fisheries, hatcheries or the spawning grounds.

Stray Rate: Percent of freshwater or total returns outside of their release watershed.

Trigger for recovery phases: These are biologically based, quantitative goals (e.g., number of NOS) and are typically based on a 5-year average so that phase shifts are based on long-term population trends. Phase shifts can be either up or down depending on the population trend.

Wild: Reserved for cases where population traits are shaped by exclusively or nearly so by natural selection in the wild rather than selection in the hatchery environment. We consider this term inappropriate for natural populations with continued, frequent, bi-directional demographic exchange and gene flow with hatchery populations.

Appendix A. Regional Hatchery and Fishery Reform Policy Report Card

	Region					
Policy Guideline	1	2	3	4	5	6
Guideline 1	●	●	●	●	●	●
Principle 1	●	●	●	●	●	●
Recommendation 1	●	●	●	●	●	●
Recommendation 2	●	●	●	●	●	●
Recommendation 3	○	○	○	○	○	○
Principle 2	●	●	●	●	●	●
Recommendation 4	●	●	●	●	●	●
Recommendation 5	●	●	●	●	●	●
Recommendation 6	●	●	●	●	●	●
Recommendation 7	●	●	●	●	●	●
Recommendation 10	●	●	●	●	●	●
Recommendation 11	●	●	●	●	●	●
Recommendation 13	●	●	●	●	●	●
Principle 3	●	●	●	●	●	●
Recommendation 15	○	○	○	○	○	○
Recommendation 16	●	●	●	●	●	●
Recommendation 17	●	●	●	●	●	●
Guideline 2	●	●	●	●	●	●
Guideline 3	●	●	●	●	●	●
Guideline 4	●	●	●	●	●	●
Guideline 5	●	●	●	●	●	●
Guideline 6	○	○	○	○	○	○
Guideline 7	○	○	○	○	○	○
Guideline 8	○	○	○	○	○	○
Guideline 9	○	○	○	○	○	○
Guideline 10	●	●	●	●	●	●
Guideline 11	●	●	●	●	●	●

Empty circle indicates implementation cannot be assessed on a regional scale.

Appendix B. Program-specific Implementation Assessment of HSRG Recommendations

Appendix B-1. Region 1 program-specific HSRG recommendation implementation assessment (green = yes; red = no).

Hatchery Program	Program Goal	Program Type	Natural Population	Population Designation	Phase of Recovery	Principle 1		Principle 2								Principle 3			
						R1	R2	R4	R5	R6	R7	R8	R9	R10	R11	R13	R14	R16	R17
Lyons Ferry Fall Chinook	Conservation	Integrated	Snake Fall Chinook	Primary	Recolonization	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Tucannon Spring Chinook	Conservation	Integrated	Tucannon Spring Chinook	Primary	Recolonization	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Tucannon Endemic Summer Steelhead	Harvest	Integrated	Tucannon Summer Steelhead	Primary	Recolonization	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Lyons Ferry-Wallowa Summer Steelhead Stock	Harvest	Segregated	No Designated	NA	NA	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Cottonwood Creek-Wallowa Summer steelhead	Harvest	Segregated	Lower Grand Ronde Summer Steelhead	Primary	Preservation	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Touchet Summer Steelhead	Conservation	Integrated	Touchet Summer Steelhead	Primary	Recolonization	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Dayton Pond-Wallowa Summer Steelhead Stock	Harvest	Segregated	Touchet Summer Steelhead	Primary	Recolonization	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Appendix B-2. Region 2 program-specific HSRG recommendation implementation assessment (green = yes; red = no).

Hatchery Program	Program Goal	Program Type	Natural Population	Population Designation	Phase of Recovery	Principle 1		Principle 2								Principle 3			
						R1	R2	R4	R5	R6	R7	R8	R9	R10	R11	R13	R14	R16	R17
Dryden Pond-Summer Chinook	Harvest	Integrated	Wenatchee Summer Chinook	Primary	Local Adaptation	🟢	🔴	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Chiwawa Spring Chinook	Conservation	Integrated	Chiwawa Spring Chinook	Primary	Preservation	🟢	🟢	🟢	🟢	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Eastbank- Nason Creek Spring Chinook	Conservation	Integrated	Wenatchee Spring Chinook	Primary	Preservation	🟢	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Chiwawa-Wenatchee Summer Steelhead	Conservation	Integrated	Wenatchee Summer Steelhead	Primary	Preservation	🟢	🟢	🟢	🟢	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Methow Hatchery Spring Chinook-Methow R. release	Conservation	Integrated	Methow Spring Chinook	Primary	Preservation	🟢	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Methow Hatchery Spring Chinook-Chewuch R. release	Conservation	Integrated	Methow Spring Chinook	Primary	Preservation	🟢	🟢	🟢	🟢	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Methow Hatchery-Twisp River Spring Chinook	Conservation	Integrated	Methow Spring Chinook	Primary	Preservation	🟢	🟢	🟢	🟢	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Carlton Pond-Summer Chinook (MEOK)	Harvest	Integrated	Methow Summer Chinook	Contributing	Local Adaptation	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢

Twisp "Wild" Summer Steelhead	Conservation	Integrated	Methow Summer Steelhead	Primary	Preservation	🟢	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Wells-MethowxOkanogan Summer Steelhead	Conservation	Integrated	Methow Summer Steelhead	Primary	Local Adaptation	🟢	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Wells Summer Chinook- Mainstem Releases	Harvest	Segregated	UCR Summer Chinook (Composite)	N/A	Local Adaptation	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Chelan Falls Eastbank OF Chinook-Chelan River Releases	Harvest	Segregated	UCR Summer Chinook (Composite)	N/A	Local Adaptation	🟢	🔴	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢

Appendix B-3. Region 3 program-specific HSRG recommendation implementation assessment (green = yes; red = no).

Hatchery Program	Program Goal	Program Type	Natural Population	Population Designation	Phase of Recovery	Principle 1		Principle 2								Principle 3			
						R1	R2	R4	R5	R6	R7	R8	R9	R10	R11	R13	R14	R16	R17
Priest Rapids Fall Chinook	Harvest	Integrated	Hanford Reach Fall Chinook	Primary	Full Recovery	No	🟢	🟢	🟢	🟢	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🟢
Ringold Springs URB Fall Chinook	Harvest	Integrated	Hanford Reach URB Fall Chinook	Primary	Full Recovery	No	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Ringold Springs Summer Steelhead	Harvest	Segregated	No Designated	NA	NA	Yes	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢

Appendix B-4. Region 4 program-specific HSRG recommendation implementation assessment (green = yes; red = no).

Hatchery Program	Program Goal	Program Type	Natural Population	Population Designation	Phase of Recovery	Principle 1		Principle 2								Principle 3			
						R1	R2	R4	R5	R6	R7	R8	R9	R10	R11	R13	R14	R16	R17
Kendall Creek NF Nooksack Spring Chinook	Conservation	Integrated	North/ Middle Fork Nooksack Spring Chinook	Primary	Preservation	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Kendall Creek SF (captive)Spring Chinook	Conservation	Integrated	South Fork Nooksack Spring Chinook	Primary	Preservation	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Marblemount Hatchery Summer Chinook	Conservation	Integrated	Upper Skagit Mainstem/ tribs Chinook	Primary	Preservation	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Marblemount Hatchery Spring Chinook	Harvest	Segregated	Upper Cascade Chinook	Primary	Local Adaptation	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Wallace River Hatchery Summer Chinook	Harvest	Integrated	Skykomish Chinook	Contributing	Recolonization	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Soos Cr and Icy Cr Hatchery Fall Chinook	Harvest	Integrated	Green River/ Duwamish Fall Chinook	Stabilizing	Recolonization	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Whatcom Creek Hatchery Chum	Harvest	Segregated	Samish/Independents Chum	Contributing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🔴	🔴	🟢	🔴	🟢
Whatcom Creek Hatchery Pink	Harvest	Segregated	Nooksack Pink	Primary	Local Adaptation	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🔴	🔴	🟢	🔴	🟢
Marblemount Hatchery Coho	Harvest	Integrated	Skagit Coho	Primary	Local Adaptation	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🔴	🟢
Baker Lake Coho	Conservation	Integrated	Baker Coho	Primary	Local Adaptation	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🔴	🟢
Wallace River Hatchery Coho	Harvest	Integrated	Skykomish Coho	Primary	Preservation	🔴	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🔴	🟢
Issaquah Hatchery Coho	Harvest	Integrated	Lake Washington, Sammamish Tribs Coho	Stabilizing	Local Adaptation	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🔴	🟢
Issaquah Hatchery Coho	Harvest	Segregated	Cedar River Coho	Stabilizing	Local Adaptation	🔴	🔴	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🔴	🟢
Green River/Soos Creek Coho	Harvest	Integrated	Green River/ Soos Creek Coho	Stabilizing	Full Recovery	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🔴	🟢
Baker River Sockeye	Harvest	Integrated	Baker River Sockeye	Primary	Preservation	🔴	🔴	🟢	🟢	🟢	🔴	🟢	🔴	🟢	🟢	🔴	🟢	🔴	🟢

Cedar River Sockeye	Harvest	Integrated	Cedar River Sockeye	Stabilizing	Preservation	🔴	🔴	🟢	🟢	🟢	🔴	🟢	🔴	🟢	🟢	🔴	🟢	🔴	🟢
Samish Hatchery Fall Chinook	Harvest	Segregated	Mainstem/ North Fork Nooksack Chinook	Primary	NA	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢
Glenwood Springs Hatchery Fall Chinook - LLTK	Harvest	Segregated	Mainstem/ North Fork Nooksack Chinook	Primary	NA	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🔴	🟢	🔴	🟢	🔴	🟢
Issaquah Hatchery Fall Chinook	Harvest	Integrated	Issaquah and North Lake WA Tributaries Fall Chinook (TRT)	Stabilizing	Recolonization	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢
Kendall Creek Hatchery Winter Steelhead	Harvest	Segregated	Mainstem/ North Fork Nooksack Winter Steelhead	Primary	NA	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Whitehorse Pond Winter Steelhead	Harvest	Segregated	Stillaguamish Winter Steelhead	Contributing	NA	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Whitehorse Pond Summer Steelhead	Harvest	Segregated	Deer Creek, Canyon Creek Summer Steelhead	Primary- Deer Cr. Stabilizing - Canyon Cr.	NA	🟢	🔴	🟢	🔴	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🟢
Reiter Ponds Winter Steelhead	Harvest	Segregated	Snohomish /Skykomish Winter Steelhead	Contributing	NA	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢

Wallace River Hatchery Winter Steelhead	Harvest	Segregated	Snohomish /Skykomish Winter Steelhead	Contributing	NA	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Reiter Ponds Summer Steelhead	Harvest	Segregated	N/S Fork Skykomish Summer Steelhead	Primary	NA	🟢	🔴	🟢	🔴	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🟢
Tokul Creek Hatchery Winter Steelhead	Harvest	Segregated	Snoqualmi e Winter Steelhead	Contributing	NA	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Soos Creek Hatchery Late-Winter Steelhead	Conservation	Integrated	Green River/Duw amish late winter Steelhead	Contributing	Preservation	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢
Soos Creek Hatchery Summer Steelhead	Harvest	Segregated	Green River/Duw amish late winter Steelhead	Contributing	NA	🟢	🔴	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢

Appendix C-5. Region 5 program-specific HSRG recommendation implementation assessment (green = yes; red = no).

Hatchery Program	Program Goal	Program Type	Natural Population	Population Designation	Phase of Recovery	Principle 1		Principle 2								Principle 3			
						R1	R2	R4	R5	R6	R7	R8	R9	R10	R11	R13	R14	R16	R17
Coweeman Winter Steelhead, COOP	Harvest	Segregated	Coweeman Winter Steelhead	Primary	Local Adaptation	🟢	🔴	🟢	🟢	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🟢
Cowlitz Spring Chinook	Harvest	Segregated	Cowlitz Spring Chinook (upper)	Primary	Recolonization	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢
Lower Cowlitz Fall Chinook	Harvest	Integrated	Cowlitz Fall Chinook	Contributing	Local Adaptation (Recolonization for Upstream Plants (NOR))	🟢	🔴	🟢	🔴	🟢	🟢	🔴	🟢	🟢	🔴	🟢	🟢	🟢	🟢
Lower Cowlitz Fall Chinook	Harvest	Segregated	Cowlitz Fall Chinook	Contributing	Local Adaptation	🟢	🔴	🟢	🔴	🔴	🟢	🔴	🟢	🟢	🔴	🟢	🟢	🟢	🟢
Cowlitz Hatchery Type N Coho (Wild)	Harvest	Integrated	Cowlitz Coho (upper)	Primary	Recolonization (Downstream Collector Inefficiency)	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢
Cowlitz Hatchery Type N Coho	Harvest	Segregated	Cowlitz Coho (lower)	Primary	Local Adaptation	🟢	🔴	🟢	🔴	🔴	🟢	🔴	🟢	🟢	🔴	🟢	🟢	🔴	🟢
Cowlitz Lower Late-Winter Steelhead	Harvest	Integrated	Lower Cowlitz Winter Steelhead	Contributing	Local Adaptation	🟢	🔴	🟢	🔴	🟢	🔴	🔴	🟢	🟢	🔴	🟢	🟢	🔴	🟢

Cowlitz Hatchery Summer Steelhead	Harvest	Segregated	Lower Cowlitz Winter Steelhead	Contributing	Local Adaptation	🟢	🔴	🟢	🔴	🟢	🔴	🔴	🟢	🟢	🔴	🟢	🟢	🔴	🟢
Cowlitz Upper Late-Winter Steelhead	Conservation	Integrated	Upper Cowlitz/ Cispus Winter Steelhead	Primary	Recolonization	🟢	🟢	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🔴	🟢	🔴	🟢
Cowlitz Tilton Steelhead	Conservation	Integrated	(Cowlitz) Titlton Steelhead	Contributing	Recolonization	🟢	🟢	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🔴	🟢	🔴	🟢
Cowlitz Hatchery Sea-run Cutthroat	Harvest	Segregated	Cowlitz Coastal Cutthroat	Contributing	NA	🔴	🔴	🟢	🔴	🔴	🔴	🔴	🟢	🟢	🔴	🔴	🟢	🔴	🟢
Beaver Creek (Elochoman) Summer Steelhead	Harvest	Segregated	Elochoman /Skamakowa Winter Steelhead	Local Adaptation	Local Adaptation	🟢	🔴	🟢	🟢	🟢	🔴	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🟢
Beaver Creek (Elochoman) Winter Steelhead	Harvest	Segregated	Elochoman /Skamakowa Winter Steelhead	Local Adaptation	Local Adaptation	🟢	🔴	🟢	🟢	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🟢
Grays River Fall Chum	Conservation	Integrated	Grays/Chinook Chum	Primary	Local Adaptation	🟢	🟢	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🟢
Grays River Type N Coho	Harvest	Integrated	Grays/Chinook Coho	Primary	Local Adaptation	🟢	🔴	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🔴	🟢	🟢	🟢	🟢
Deep River Net Pen Type N Coho	Harvest	Segregated	Grays/Chinook Coho	Primary	Local Adaptation	🟢	🔴	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🟢

Kalama River Hatchery Fall Chinook	Harvest	Segregated	Kalama Fall Chinook	Contributing	Local Adaptation	🟢	🔴	🟢	🟢	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Kalama Hatchery (Fallert) Spring Chinook	Harvest	Segregated	Kalama Spring Chinook	Primary	Local Adaptation	🟢	🔴	🟢	🟢	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Kalama Falls Type N Coho	Harvest	Segregated	Kalama Coho	Contributing	Local Adaptation	🟢	🔴	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🟢
Kalama Wild Summer Steelhead	Harvest	Integrated	Kalama Summer Steelhead	Primary	Local Adaptation	🟢	🔴	🟢	🟢	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🟢
Kalama Wild Late-Winter Steelhead	Harvest	Integrated	Kalama Winter Steelhead	Primary	Local Adaptation	🟢	🔴	🟢	🟢	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🟢
Washougal Hatchery Type N Coho- Klickitat R. Outplant	Harvest	Segregated	Klickitat Coho	NA	NA	🔴	🔴	🟢	🔴	🔴	🔴	🟢	🟢	🔴	🟢	🟢	🟢	🔴	🟢
Skamania Hatchery Summer Steelhead-Outplant	Harvest	Segregated	Klickitat Summer Steelhead	Primary	Local Adaptation	🔴	🔴	🟢	🔴	🟢	🔴	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🟢
(Lower) Lewis River Hatchery-(Speelyai) Spring Chinook	Harvest	Segregated	Lewis Spring Chinook	Primary	Preservation	🟢	🔴	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢
(Upper) Lewis River Hatchery-(Speelyai) Spring Chinook	Conservation	Integrated	Lewis Spring Chinook	Primary	Preservation	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢

Lewis Basin (I-205) Chum Enhancement	Conservation	Integrated	Lewis Chum	Primary	Recolonization	🟢	🟢	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🔴	🔴	🟢	🟢	🟢
Lewis River Hatchery Type N Coho	Harvest	Segregated	NF Lewis Coho	Contributing	Recolonization	🟢	🔴	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢
Speelyai Type N Coho (Fish First RSI)	Conservation	Integrated	NF Lewis Coho	Contributing	Recolonization	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🔴	🟢
Lewis River (Speelyai) Hatchery Type S Coho	Harvest	Segregated	NF Lewis Coho	Contributing	Recolonization	🟢	🔴	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢
Merwin (Lewis) Late-Winter Steelhead	Conservation	Integrated	NF Lewis Winter Steelhead	Contributing	Recolonization	🟢	🟢	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🟢	🟢	🔴	🟢
Merwin Hatchery Winter Steelhead	Harvest	Segregated	NF Lewis Winter Steelhead	Contributing	Recolonization	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🟢	🟢	🔴	🟢
Merwin Hatchery Summer Steelhead	Harvest	Segregated	NF Lewis Summer Steelhead	Stabilizing	Preservation	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🟢	🟢	🔴	🟢
Bonneville Fall Chum (Wild)	Conservation	Integrated	Lower Gorge Chum	Primary	Local Adaptation	🟢	🟢	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🟢
Rock Creek Outplant-Big Creek Stock (Skamania)	Harvest	Segregated	Upper Gorge Winter Steelhead	Primary	Local Adaptation	🔴	🔴	🟢	🟢	🟢	🔴	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🟢
Klineline Ponds (Lewis Stock) Type N Coho COOP Project	Harvest	Segregated	Salmon Creek Coho	Stabilizing	Local Adaptation	🔴	🔴	🟢	🟢	🟢	🔴	🟢	🟢	🔴	🟢	🔴	🟢	🔴	🟢

Skamania Winter Steelhead (Klineline Ponds-KF Stock)	Harvest	Segregated	Salmon Creek Winter Steelhead	Stabilizing	Local Adaptation	🔴	🔴	🟢	🟢	🟢	🔴	🟢	🟢	🔴	🟢	🟢	🟢	🔴	🟢
NF Toutle Hatchery Fall Chinook	Harvest	Integrated	Toutle Fall Chinook	Primary	Local Adaptation	🟢	🔴	🟢	🟢	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢
NF Toutle Hatchery Type S Coho	Harvest	Integrated	NF Toutle Coho	Primary	Local Adaptation	🟢	🔴	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢
SF Toutle Summer Steelhead (COOP)	Harvest	Segregated	SF Toutle Winter Steelhead	Primary	Local Adaptation	🟢	🔴	🟢	🟢	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🟢
Washougal Hatchery Fall Chinook	Harvest	Integrated	Washougal Fall Chinook	Primary	Local Adaptation	🟢	🔴	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Washougal Type N. Coho	Harvest	Integrated	Washougal Coho	Contributing	Local Adaptation	🟢	🔴	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Summer Steelhead (Skamania-Washougal)	Harvest	Segregated	Washougal Summer Steelhead	Primary	Local Adaptation	🟢	🔴	🟢	🟢	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🟢
Skamania Winter Steelhead	Harvest	Segregated	Washougal Winter Steelhead	Contributing	Local Adaptation	🟢	🔴	🟢	🟢	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🟢
Cathlamet Channel Net Pens Spring Chinook	Harvest	Segregated	Elochoman /Skamakowa Fall Chinook	Primary	Local Adaptation	🔴	🔴	🟢	🟢	🟢	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🟢

Appendix C-6. Region 6 program-specific HSRG recommendation implementation assessment (green = yes; red = no).

Hatchery Program	Program Goal	Program Type	Natural Population	Population Designation	Phase of Recovery	Principle 1		Principle 2								Principle 3			
						R1	R2	R4	R5	R6	R7	R8	R9	R10	R11	R13	R14	R16	R17
Voights Creek Hatchery Fall Chinook	Harvest	Integrated	Puyallup Fall Chinook	Stabilizing	Recolonization	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢
Hupp Springs Hatchery Spring Chinook	Conservation	Segregated	White River Spring Chinook (Puyallup)	Primary	Preservation	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
George Adams Hatchery Fall Chinook	Harvest	Integrated	Skokomish Chinook	Stabilizing	Recolonization	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Dungeness Hatchery Spring Chinook	Conservation	Integrated	Dungeness Spring Chinook	Primary	Preservation	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Elwha Hatchery Fall Chinook	Conservation	Integrated	Elwha Chinook	Primary	Preservation	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Sol Duc Summer Chinook	Harvest	Integrated	Sol Duc Summer Chinook	Primary	Full Recovery	🔴	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🔴	🔴	🟢	🟢
Humptulips Hatchery Fall Chinook	Harvest	Integrated	Humptulips River Fall Chinook	Contributing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🔴	🔴	🟢	🟢
Mayr Brothers Fall Chinook	Harvest	Integrated	Wishkah Fall Chinook	Stabilizing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🔴	🔴	🔴	🟢

Lake Aberdeen Fall Chinook	Harvest	Integrated	Wynoochee Fall Chinook	Contributing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🔴	🔴	🔴	🟢
Bingham Creek Fall Chinook	Conservation	Integrated	Satsop Fall Chinook	Contributing	Full Recovery	🔴	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🔴	🔴	🟢	🟢
Forks Creek Hatchery Fall Chinook	Harvest	Integrated	Willapa Fall Chinook	Primary	Local Adaptation	🔴	🔴	🟢	🔴	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Naselle Hatchery Fall Chinook	Harvest	Integrated	Naselle Fall Chinook	Contributing	Local Adaptation	🔴	🔴	🟢	🔴	🟢	🔴	🔴	🟢	🟢	🟢	🔴	🟢	🟢	🟢
McKernan Hatchery Chum	Harvest	Segregated	Lower Skokomish Fall Chum	Contributing	Full Recovery	🔴	🔴	🟢	🔴	🔴	🔴	🔴	🔴	🟢	🔴	🔴	🟢	🔴	🟢
Satsop Springs Fall Chum, Coop	Conservation	Integrated	Chehalis Chum	Contributing	Full Recovery	🔴	🟢	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🔴	🔴	🔴	🔴	🟢
Mayr Brothers Fall Chum	Harvest	Integrated	Chehalis Chum	Contributing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🔴	🔴	🔴	🔴	🟢
March Spawning Channel Fall Chum, Coop	Conservation	Integrated	North River Chum	Primary	Local Adaptation	🔴	🟢	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🔴	🔴	🟢	🔴	🟢
Forks Creek Hatchery Fall Chum	Conservation	Integrated	Willapa Fall Chum	Contributing	Local Adaptation	🔴	🟢	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🔴	🔴	🟢	🔴	🟢
Nemah Hatchery Fall Chum	Conservation	Integrated	Nemah Chum	Contributing	Local Adaptation	🔴	🟢	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🔴	🔴	🟢	🔴	🟢

Naselle Hatchery Fall Chum	Conservation	Integrated	Naselle Chum	Stabilizing	Local Adaptation	🔴	🟢	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🔴	🔴	🟢	🔴	🟢
Voights Creek Hatchery Coho	Harvest	Integrated	Voights Creek Hatchery Coho	Stabilizing	Recolonization	🔴	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🔴	🟢
Minter Creek Hatchery Coho	Harvest	Integrated	Minter Creek Hatchery Coho	Contributing	Local Adaptation	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🔴	🟢	🔴	🟢
South Sound Net Pens	Harvest	Segregated	South Sound Net Pens	Contributing	Local Adaptation	🔴	🔴	🟢	🔴	🔴	🔴	🟢	🟢	🔴	🔴	🟢	🟢	🔴	🟢
George Adams Hatchery Coho	Harvest	Segregated	George Adams Hatchery Coho	Contributing	Full Recovery	🔴	🔴	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🔴	🟢
Dungeness Hatchery Coho	Harvest	Segregated	Dungeness Coho	Stabilizing	Local Adaptation	🔴	🔴	🟢	🔴	🔴	🔴	🟢	🟢	🟢	🔴	🔴	🟢	🔴	🟢
Sol Duc Hatchery Summer Coho	Harvest	Segregated	Sol Duc Summer Coho	Primary	Full Recovery	🔴	🔴	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🔴	🔴	🔴	🔴	🟢
Sol Duc Hatchery Fall Coho	Harvest	Integrated	Sol Duc Coho	Contributing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🔴	🔴	🟢
Humptulips Hatchery Late-Coho	Harvest	Integrated	Humptulips River Coho	Contributing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🟢	🔴	🟢	🟢	🔴	🔴	🔴	🔴	🟢

Humptulips Hatchery Coho	Harvest	Integrated	Humptulips River Coho	Contributing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🟢	🔴	🟢	🟢	🔴	🔴	🔴	🔴	🟢
Mayr Brothers Wishkah Coho	Harvest	Integrated	Wishkah Coho	Stabilizing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🔴	🔴	🔴	🟢
Lake Aberdeen Hatchery Coho	Harvest	Integrated	Wynooche Coho	Contributing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🔴	🔴	🔴	🟢
Bingham Creek Hatchery Late-Coho	Harvest	Integrated	Satsop Coho	Contributing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🔴	🔴	🔴	🟢
Bingham Creek Hatchery Coho	Harvest	Integrated	Satsop Coho	Primary	Full Recovery	🔴	🔴	🟢	🔴	🟢	🟢	🔴	🟢	🟢	🔴	🟢	🔴	🔴	🟢
Satsop Springs Coho, Coop	Harvest	Integrated	Satsop Coho	Primary	Full Recovery	🔴	🔴	🟢	🔴	🟢	🟢	🔴	🟢	🟢	🔴	🟢	🔴	🔴	🟢
Carlisle Pond Coho, Coop	Harvest	Integrated	Chehalis Coho	Contributing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🔴	🔴	🔴	🔴	🔴	🟢
Carlisle Pond Late-Coho, Coop	Harvest	Integrated	Chehalis Coho	Contributing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🔴	🔴	🔴	🔴	🔴	🟢
Skookumchuck Hatchery Late-Coho	Harvest	Integrated	Chehalis Coho	Contributing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🔴	🔴	🟢	🟢	🔴	🔴	🔴	🔴	🟢
Skookumchuck Hatchery Coho	Harvest	Integrated	Chehalis Coho	Contributing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🔴	🔴	🔴	🟢

Eight Creek Late-Coho, Coop	Harvest	Integrated	Chehalis Coho	Contributing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🔴	🔴	🔴	🔴	🔴	🟢
March Spawning Channel Coho, Coop	Harvest	Segregated	North River/Smith Cr Coho	Primary	Full Recovery	🔴	🔴	🟢	🔴	🔴	🔴	🟢	🟢	🔴	🔴	🔴	🟢	🔴	🟢
Forks Creek Hatchery Late-Coho	Harvest	Integrated	Willapa Coho	Primary	Full Recovery	🔴	🔴	🟢	🔴	🟢	🟢	🔴	🟢	🟢	🔴	🔴	🟢	🔴	🟢
Forks Creek Hatchery Coho	Harvest	Integrated	Willapa Coho	Primary	Full Recovery	🔴	🔴	🟢	🔴	🟢	🟢	🔴	🟢	🟢	🔴	🟢	🟢	🔴	🟢
Naselle Hatchery Coho	Harvest	Integrated	Naselle Coho (Normals)	Stabilizing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🔴	🟢
Naselle Hatchery Late-Coho	Harvest	Integrated	Naselle Coho (Lates)	Stabilizing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🔴	🟢	🔴	🟢
McKernan Hatchery Late-Winter Steelhead (NOAA)	Conservation	Integrated	Skokomish Winter Steelhead	Primary	Recolonization	🟢	🟢	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢
Bogachiel Late-Winter Steelhead, Coop	Harvest	Integrated	Quillayute/ Bogachiel Winter Steelhead	Contributing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🟢	🔴	🔴	🟢
Dungeness Hatchery Winter Steelhead	Harvest	Segregated	Dungeness River Winter Steelhead	Contributing	Recolonization	🔴	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢

Bogachiel Hatchery Summer Steelhead	Harvest	Segregated	Quillayute/ Bogachiel Summer Steelhead	Contributing	NA	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🟢	🔴	🔴	🟢
Bogachiel Hatchery Winter Steelhead	Harvest	Segregated	Quillayute/ Bogachiel Winter Steelhead	Contributing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🟢	🔴	🔴	🟢
Humptulips Hatchery Summer Steelhead	Harvest	Segregated	Humptulips Summer Steelhead	Stabilizing	NA	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🟢	🔴	🔴	🟢
Humptulips Hatchery Winter Steelhead	Harvest	Segregated	Humptulips Winter Steelhead	Contributing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🟢	🔴	🔴	🟢
Lake Aberdeen Hatchery Late-Winter Steelhead	Harvest	Integrated	Wynoochee Winter Steelhead	Contributing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🟢	🔴	🔴	🟢
Lake Aberdeen Hatchery Summer Steelhead	Harvest	Segregated	Wynoochee Winter Steelhead	Contributing	Full Recovery	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🟢	🔴	🔴	🟢
Bingham Creek Hatchery Late-Winter Steelhead	Harvest	Integrated	Satsop Winter Steelhead	Contributing	Local Adaptation	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🟢	🔴	🔴	🟢
Carlisle Pond Late-Winter Steelhead, Coop	Harvest	Integrated	Skookumchuck/ Newaukum Winter Steelhead	Contributing	Local Adaptation	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🔴	🔴	🟢	🔴	🔴	🟢
Skookumchuck Hatchery Late-Winter Steelhead	Harvest	Integrated	Skookumchuck/Newaukum Winter Steelhead	Contributing	Local Adaptation	🔴	🔴	🟢	🔴	🟢	🔴	🔴	🟢	🟢	🔴	🟢	🔴	🔴	🟢

Forks Creek Winter Steelhead	Harvest	Segregated	Willapa Winter Steelhead	Contributing	NA	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🟢	🟢	🔴	🟢
Naselle Hatchery Winter Steelhead	Harvest	Segregated	Naselle Winter Steelhead	Contributing	NA	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🟢	🟢	🔴	🟢
Hoodsport Hatchery Fall Chinook	Harvest	Segregated	Skokomish and Mid-HC Chinook	Primary	Preservation	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢
Hurd Creek Hatchery Pink	Conservation	Integrated	Lower and upper Dungeness pink	Contributing	Preservation	🔴	🟢	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🔴	🔴	🟢	🔴	🟢
Chambers Creek Hatchery Fall Chinook	Harvest	Segregated	NA	NA	NA	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🔴	🔴	🔴	🟢	🟢	🟢
Tumwater Falls Fall Chinook	Harvest	Segregated	NA	NA	NA	🔴	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🔴	🔴	🔴	🟢	🔴	🟢
Minter Creek Hatchery Fall Chinook	Harvest	Segregated	NA	NA	NA	🔴	🔴	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🔴	🔴	🟢	🟢	🟢
Hoodsport Hatchery Fall Chum	Harvest	Segregated	NA	NA	NA	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🔴	🔴	🟢	🔴	🟢
Hoodsport Hatchery Pinks	Harvest	Segregated	NA	NA	NA	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🔴	🔴	🟢	🔴	🟢
Nemah Hatchery Fall Chinook	Harvest	Segregated	Nemah Fall Chinook	Stabilizing	Local Adaptation	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟢	🟢	🔴	🔴	🟢	🟢	🟢

Minter Creek Hatchery Chum	Harvest	Integrated	Carr Inlet	Stabilizing	Local Adaptation	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🔴	🟢	🔴	🔴	🟢	🔴	🟢

Appendix C. WDFW Hatchery and Fishery Reform Actions

Region	Category	Status	Year	Species	Action
1	Hatchery	Completed	1976	Fall Chinook	Snake River Fall Chinook egg bank program - Kalama Hatchery, Hagerman Hatchery, Tucannon Hatchery - Preservation of stock
1	Hatchery	Completed	1985	Fall Chinook	FCH broodstock trapping and rearing at Lyons Ferry Hatchery was started, egg bank program phased out.
1	Hatchery	Completed	1990	Fall Chinook	Began trapping fall Chinook at Lower Granite, continue trapping at Lyons Ferry, reduce trapping at Ice Harbor because of strays
1	Hatchery	Completed	1990	Fall Chinook	Reading of CWT's in real time prior to spawning for broodstock management/stray removal for Snake River fall Chinook
1	Hatchery	Completed	1993	Fall Chinook	Phased out Ice Harbor Dam for trapping Snake River Fall Chinook broodstock due to high number of strays (Umatilla Stock)
1	Hatchery	Completed	1996	Fall Chinook	Rearing and release of year Snake River fall Chinook in one of the large rearing lakes at Lyons Ferry Hatchery to increase survival and more efficient rearing
1	Hatchery	Completed	1996	Fall Chinook	Releases start to occur again above Lower Granite Dam for Snake River fall Chinook at Acclimation Sites (FCAP) operated by Nez Perce Tribe
1	Hatchery	Completed	2000	Fall Chinook	Start fulfilling Idaho Power mitigation for Snake River Fall Chinook
1	Hatchery	Completed	2002	Fall Chinook	Nez Perce Tribal Hatchery was complete and started rearing Snake River Fall Chinook salmon
1	Hatchery	Completed	2004	Fall Chinook	Reduced rearing densities on Snake River fall Chinook to reduce disease outbreaks (BKD and gill disease)
1	Hatchery	Completed	2005	Fall Chinook	Use of Adult Ponds for rearing subyearling fall Chinook - lower densities to address gill disease issues
1	Hatchery	Completed	2008	Fall Chinook	Splitting of Adult Ponds to improve disease issues (gill disease) with subyearling fall Chinook (Flow pattern changes)
1	Fishery	In Progress	2009	Fall Chinook	Pacific Salmon Treaty - reduction of Snake River Fall Chinook harvest by 15% in SE AK, and 30% off BC.

1	Fishery	In Progress	2009	Fall Chinook	Columbia River harvest of Fall Chinook reduced in new US v Oregon Management Agreement (21-45%)
1	Hatchery	Completed	2010	Fall Chinook	Spawning protocol change for SNR fall Chinook to eliminate/reduce the use of jacks/jills in the future
1	Hatchery	In Progress	2011	Fall Chinook	Parental Based Tagging (PBT) samples taken on Fall Chinook broodstock for future determination of wild/hatchery origin fish
1	Hatchery	Completed	2018	Fall Chinook	Elimination of yearling Snake River fall Chinook from FCAP release sites converted to subyearlings
1	Hatchery	In Progress	2018	Fall Chinook	New Marking/Tagging agreement for Snake River fall Chinook Salmon (50% Ad clipped rate) - all releases represented by a 200K AD/CWT group
1	Hatchery	In Progress	2019	Fall Chinook	On-station release of fall Chinook subyearlings moved to large rearing lake at Lyons Ferry for final rearing (2 months) and release
1	Hatchery	Planned	2025	Fall Chinook	Reduction or elimination of yearling Snake River fall Chinook releases at Lyons Ferry - converted to subyearling program
1	Hatchery	Completed	1990	SH/SPCH	Addition of Mitsubishi Floating Weir at Tucannon FH for spring Chinook broodstock collection/enumeration
1	Hatchery	Completed	1997	SH/SPCH	Completion of new adult trap/fish ladder on Tucannon River at the Tucannon FH Intake Structure
1	Hatchery	Completed	2005	SH/SPCH	Brail floor added to Tucannon FH Adult Trap - for better handling of Spring Chinook, Steelhead and Bull Trout
1	Hatchery	Completed	2008	SH/SPCH	Parental Based Tagging (PBT) samples taken on steelhead and spring Chinook broodstock or future determination of wild/hatchery origin fish to Snake Basin
1	Hatchery	Completed	1985	Spring Chinook	Spring Chinook mitigation program begins on the Tucannon River - conservation intent mostly
1	Hatchery	Completed	1985	Spring Chinook	2x2 Factorial Matings for Spring Chinook program
1	Hatchery	Completed	1998	Spring Chinook	Release of Tucannon SPCH at Curl Lake to address redd distribution and survival
1	Hatchery	Completed	2002	Spring Chinook	Hatchery fish no longer clipped (100 wire tagged) to remove mark selective fishery pressure downriver

1	Hatchery	Completed	2005	Spring Chinook	Increase size at release for Tucannon SPCH to increase survival rates and adult returns
1	Hatchery	Completed	2006	Spring Chinook	Increase Tucannon Spring Chinook production to 225K to address adult return goals
1	Hatchery	Completed	2014	Spring Chinook	New Size at Release set at 12 fpp following size at release study
1	Hatchery	Completed	2015	Spring Chinook	Adult holding/out planting to address high pre-spawn mortality issues
1	Hatchery	Completed	2015	Spring Chinook	Stream Nutrient Enhancement in Tucannon River with carcasses from Lyons Ferry
1	Hatchery	In Progress	2019	Spring Chinook	Juvenile rearing on of the large rearing lakes at Lyons Ferry
1	Hatchery	In Progress	2020	Spring Chinook	Earlier acclimation and release from Curl Lake AP
1	Hatchery	Completed	1982	Steelhead	Summer Steelhead harvest mitigation programs began at Lyons Ferry Hatchery - nonlocal stocks used
1	Hatchery	Completed	1985	Steelhead	Cottonwood Acclimation Site completed for steelhead - no longer a direct stream release - Volitional release implemented
1	Hatchery	Completed	1986	Steelhead	Changed size of release on hatchery steelhead from 8 fpp to 4.5-5 fpp to reduce residualism and increase survival of hatchery releases
1	Hatchery	Completed	1987	Steelhead	Dayton Acclimation Site completed for steelhead - no longer a direct stream release - Volitional Release implemented
1	Hatchery	Completed	1992	Steelhead	Bio-security protocols and spawning protocols for steelhead changed due to massive IHNV outbreaks in 1990 and 1991
1	Hatchery	Completed	1992	Steelhead	Cottonwood Adult Trap construction to collect broodstock, remove excess hatchery fish, or to concentrate hatchery fish in Cottonwood Creek
1	Hatchery	Completed	1995	Steelhead	Preceding ESA listing of SH, stopped releasing hatchery steelhead in Wildcat Creek (Grande Ronde, Oregon)
1	Hatchery	Completed	1997	Steelhead	Lyons Ferry stock steelhead releases in Tucannon River moved to lower Tucannon Basin to reduce interactions with wild fish and better survival for harvest fisheries

1	Hatchery	Completed	1997	Steelhead	Following ESA listing of SH, stopped releasing hatchery steelhead in Asotin Creek
1	Hatchery	Completed	1997	Steelhead	Designated Asotin Creek as Wild Steelhead Refuge
1	Hatchery	Completed	1997	Steelhead	Temporary Dayton Adult Trap - remove hatchery steelhead from upper Touchet River
1	Fishery	Completed	1997	Steelhead	Stop the release of Rainbow trout into area streams - only into area lakes from this point forward
1	Fishery	Completed	1997	Steelhead	Elimination of Brown Trout releases in the Touchet River basin
1	Hatchery	Completed	1998	Steelhead	Following ESA listing of SH, stopped releasing hatchery steelhead at random sites in the Snake River
1	Hatchery	Completed	1998	Steelhead	Following ESA listing of SH, stopped releasing hatchery steelhead in Mill Creek (Walla Walla Basin)
1	Hatchery	Completed	2000	Steelhead	Initiation of Tucannon and Touchet Rivers local steelhead stocks
1	Hatchery	Completed	2000	Steelhead	Removal of hatchery steelhead (Lyons Ferry stock) at Tucannon FH adult trap
1	Hatchery	Completed	2001	Steelhead	Reduced hatchery steelhead releases in this time period by ~25% across most locations in SE Washington to address adult returns that were far exceeding goals
1	Hatchery	Completed	2005	Steelhead	Asotin Creek wild steelhead production monitoring - removal of hatchery fish at weir locations
1	Hatchery	Completed	2008	Steelhead	Release of hatchery steelhead in Walla Walla moved out of potential natural production areas
1	Hatchery	Completed	2010	Steelhead	Elimination of Lyons Ferry stock steelhead in Tucannon River, implementation of Tucannon stock steelhead to full production
1	Hatchery	Completed	2013	Steelhead	Adoption of Tucannon SH broodstock sliding scale for mitigation and conservation programs
1	Hatchery	Completed	2014	Steelhead	Lyons Ferry On-station release of steelhead reduced by 50,000

1	Hatchery	In Progress	2015	Steelhead	Wallowa stock reciprocal rearing study started
1	Hatchery	Completed	2017	Steelhead	Elimination of Walla Walla river steelhead release
1	Hatchery	Completed	2018	Steelhead	Lyons Ferry On-station release of steelhead reduced by 50,000
1	Hatchery	In Progress	2020	Steelhead	Better external marking of Tucannon SH for broodstock/trap management of hatchery fish
1	Hatchery	Planned	2022	Steelhead	Elimination of Wallowa stock steelhead release at Lyons Ferry
1	Hatchery	Planned	2022	Steelhead	Tucannon steelhead stock release at Lyons Ferry implemented?
1	Hatchery	Planned	2024	Steelhead	Elimination of Wallowa stock steelhead release at Dayton Acclimation Pond?
1	Hatchery	Planned	2024	Steelhead	Implement Touchet steelhead stock program in Touchet River?
2	Hatchery	Completed	2011	Sockeye	Ceased hatchery program for Wenatchee sockeye salmon
2	Hatchery	Completed	2010	Spring Chinook	Reduced program size of Wenatchee (Chiwawa) spring Chinook (672,000 to 144,026)
2	Hatchery	Completed	2010	Spring Chinook	Limit broodstock collection to 33% of natural population for Wenatchee (Chiwawa) spring Chinook
2	Hatchery	Completed	2010	Spring Chinook	Initiated volitional release for all Wenatchee (Chiwawa) spring Chinook from Chiwawa Ponds
2	Hatchery	Completed	2011	Spring Chinook	Initiated local broodstock collection at Chiwawa Weir for Chiwawa spring Chinook
2	Fishery	Completed	2013	Spring Chinook	Initiated adult management of excess hatchery-origin Wenatchee (Chiwawa) spring Chinook in fisheries
2	Hatchery	Completed	2013	Spring Chinook	Initiated adult management of excess hatchery-origin Wenatchee (Chiwawa) spring Chinook at Tumwater Dam

2	Hatchery	Completed	2013	Spring Chinook	Developed WxW Wenatchee (Nason) program
2	Hatchery	Completed	2013	Spring Chinook	Cessation of hatchery-origin jacks in broodstock for Wenatchee (Chiwawa and Nason) spring Chinook
2	Hatchery	Completed	2014	Spring Chinook	Established PHOS and PNI goals for Wenatchee s(Chiwawa) spring Chinook
2	Hatchery	Completed	2015	Spring Chinook	Ceased hatchery program for Wenatchee (White River) spring Chinook
2	Hatchery	Completed	2000	Steelhead	Initiated overwinter rearing of steelhead on Wenatchee River water at Chiwawa Ponds
2	Hatchery	Completed	2002	Steelhead	Ceased rearing of steelhead on well water full term at Eastbank FH due to poor performance
2	Hatchery	In Progress	2010	Steelhead	Initiated adult management of excess hatchery-origin Wenatchee steelhead at Tumwater Dam
2	Hatchery	Completed	2010	Steelhead	Established PHOS and PNI goals for Wenatchee steelhead
2	Hatchery	Completed	2010	Steelhead	Initiated use of circular reuse vessel for overwinter rearing for a portion of Wenatchee steelhead
2	Fishery	Completed	2011	Steelhead	Implemented mandatory retention of hatchery-origin steelhead in Wenatchee
2	Hatchery	Completed	2011	Steelhead	Eliminated HxW crosses of Wenatchee steelhead in mating
2	Hatchery	Completed	2012	Steelhead	Reduced program size of Wenatchee steelhead (400,000 to 247,300)
2	Hatchery	Completed	2012	Steelhead	Limit broodstock collection to 33% of natural population for Wenatchee steelhead
2	Hatchery	Completed	2012	Steelhead	Consolidated rearing location to Eastbank Fish Hatchery with new water chiller system - Wenatchee steelhead
2	Hatchery	Completed	2012	Steelhead	Overwinter entire Wenatchee steelhead program at Chiwawa Ponds

2	Hatchery	Completed	2012	Steelhead	Began volitional release of a portion of Wenatchee steelhead program
2	Hatchery	Completed	2009	Summer Chinook	Initiated use of circular reuse vessels at Eastbank for a portion of Wenatchee summer Chinook
2	Hatchery	Completed	2012	Summer Chinook	Began using 100% natural-origin brood for Wenatchee summer Chinook
2	Hatchery	Completed	2012	Summer Chinook	Reduced program size of Wenatchee summer Chinook (864,000 to 500,001)
2	Hatchery	Completed	2014	Summer Chinook	Enabled a portion of Wenatchee summer Chinook to be released volitionally
3	Hatchery	Completed	1982	Fall Chinook	Mark rate of 200,000 fish for PRH production becomes more consistent target (Adclip+CWT)
3	Hatchery	Completed	2007	Fall Chinook	Initiated an otolith marking program (thermal mark) for 100% of PRH production
3	Hatchery	Completed	2009	Fall Chinook	Updated M&E program supported greater sampling/analysis of otoliths
3	Hatchery	Completed	2009	Fall Chinook	Improved the entrance of the Ringold Springs Hatchery discharge channel to improve usage of returning adult salmonids during low river elevations thereby reducing pHOS
3	Hatchery	Completed	2010	Fall Chinook	Initiated an otolith marking program (thermal mark) for 100% of the RSH production (Discontinued after brood year 2016)
3	Hatchery	Completed	2010	Fall Chinook	Increased tag and mark rate for PRH production (600,000 Adclip+CWT; 1-1.1 million CWT)
3	Hatchery	Completed	2010	Fall Chinook	Increasing pNOB by collecting fish from OLAFT
3	Hatchery	Completed	2012	Fall Chinook	Modified the number of CWT only fish released by PRH to 600000; initiated marking an additional 1000000 fish with ad clip only
3	Hatchery	Completed	2012	Fall Chinook	Angler broodstock collection to increase pNOB
3	Hatchery	Completed	2014	Fall Chinook	Real time otolith reading during spawning to maximize natural origin brood fish as parents (Discontinued prior to Return Year 2018)

3	Hatchery	Completed	2015	Fall Chinook	Created closed fishing waters adjacent to the Ringold Springs Hatchery discharge channel to promote better attraction of returning adults to the Ringold Springs Hatchery adult volunteer trap; hence reduce pHOS in the Hanford Reach
3	Hatchery	Completed	2016	Fall Chinook	Increased the coded wire tag group from 200K to 450K for the Chinook smolts released from Ringold Springs Hatchery which improves the ability to evaluate adult strays (began with brood year 2015)
3	Hatchery	Completed	2016	Fall Chinook	Began including PIT tag groups with the Chinook smolts released from Ringold Springs Hatchery to evaluate migration timing-impacts to non target taxa (began with brood year 2015)
3	Hatchery	Completed	2016	Fall Chinook	Began prioritizing broodstock at PRH to exclude known hatchery origin fish (Ad-clip and/or CWT tagged) to the extent possible
3	Hatchery	Completed	2018	Fall Chinook	Maintenance of continuous operation of the volunteer trap at PRH and RSH to remove surplus hatchery origin fish from the Hanford Reach
3	Fishery	Completed	2008	Steelhead	Closed whitefish fishery downstream of Granger to protect steelhead
3	Hatchery	Completed	2015	Steelhead	Began including PIT tag groups with the steelhead smolts released from Ringold Springs Hatchery to evaluate migration timing-impacts to non-target taxa and adult straying (Discontinued after the 2017 release)
3	Hatchery	Completed	2016	Steelhead	Included coded wire tag group with releases for steelhead smolts from Ringold Springs Hatchery to evaluate adult straying (Brood years 2015 - 2017)
4	Hatchery	Completed	2005	All	Implement mass-marking for all anadromous salmon and steelhead releases (Adipose clip, otolith mark and/ or tag)
4	Hatchery	Completed	2014	All	Establish recovery phase designation for natural populations associated with hatchery programs
4	hatchery	Planned	2021	All	new adult collection weir at Cedar River to capture full spectrum of run
4	Hatchery		2011	Chum	Whatcom Cr Chum; Changes in broodstock from Nooksack to an integrated Samish/Independent stock. Develop monitoring

4	Hatchery	Completed	2009	Coho	Eliminate Kendall Creek coho program
4	Hatchery	Completed	2009	Coho	Coho scale sampling to determine hatchery vs. natural abundance in broodstock
4	Hatchery	Completed	2009	Coho	Use Chinook and Coho NORs from Sunset Falls to reach integration goals at Wallace River Hatchery
4	Hatchery	Completed	2011	Coho	Baker Coho; Increase level of Nob by utilizing trapped NORs; management of HORs to reduce pHOS levels at trap
4	Hatchery	Completed	2011	Coho	Cedar River Coho; Remove HORs at Landsburg Dam
4	Hatchery	Completed	2011	Coho	Soos Cr Coho; maximize NOB returns and incorporate into broodstock
4	Hatchery		2015	Coho	Skagit River Coho reduced to 190k program
4	Hatchery	Completed	2006	Fall Chinook	Eliminate Samish and Glenwood Yearling Chinook programs
4	Hatchery		2011	Fall Chinook	Nooksack-Samish (north/middle fork) weir on the mainstem to increase NOB productivity and move toward active NOB collection
4	Hatchery	Completed	2011	Fall Chinook	Nooksack-Samish (south fork) transition to an adult supplementation program
4	Hatchery	Completed	2011	Fall Chinook	Nooksack-Samish Chinook; calculate stray rates and adjust program accordingly
4	Hatchery	Completed	2011	Fall Chinook	San Juan (Glenwood); Broodstock source switched to reduce straying into the Nooksack basin, monitoring to evaluate strays
4	Fishery	Completed	2011	Fall Chinook	Initiate Lummi tangle net pilot study

4	hatchery	completed	2012	Fall Chinook	Adult collection trap added at Icy Creek to remove pHOS
4	Hatchery	Completed	2013	Fall Chinook	Transition integrated stepping-stone program for Soos Creek/ Palmer Ponds Fall Chinook with recovery phase targets
4	hatchery	completed	2019	Fall Chinook	off channel adult pond constructed at Soos Creek with upstream passage capability
4	hatchery	completed	2019	Fall Chinook	integrated chinook program marked differently and released on-station at Soos Creek
4	hatchery	completed	2011	Sockeye	adjust incubation temperature to natural pattern at Cedar River Sockeye hatchery
4	Hatchery	Completed	2009	Spring Chinook	Kendall Creek Spring Chinook otolith marked to evaluate straying of other stocks into Nooksack
4	Hatchery	Planned	2019	Spring Chinook	Initate release time study for Marblemount Spring Chinook
4	Hatchery	Completed	2009	Steelhead	Initiate segregated early-winter steelhead cutoff of 1/31 for egg take, no out-of-basin egg transfers, run traps through end of April or May (facility dependent), no off-station plants.
4	Hatchery	Completed	2009	Steelhead	For segregated summer steelhead; no off-station plants, trapping throughout entire return timing
4	Hatchery	Completed	2009	Steelhead	Stop passing hatchery steelhead above Sunset Falls on the SF Skykomish River
4	Hatchery	Completed	2011	Steelhead	Nooksack-Samish, Stillaguamish, Snohomish, Skagit, Green River Steelhead; initiate egg take cutoff date of 1/31, run traps through 4/30. No out of basin egg transfers. No off station releases.
4	Hatchery	Completed	2011	Steelhead	Green river Steelhead; Initiate integrated conservation programs and release 1 and 2 year smolts
4	Hatchery	Completed	2012	Steelhead	Transition all segregated steelhead program is in Puget Sound to volitional release; non-migrating smolts planted in landlocked lakes

4	Hatchery	Completed	2014	Steelhead	Discontinued Soos Creek and Marblemount early-winter steelhead programs
4	Hatchery	Completed	2014	Steelhead	Discontinued Glenwood Coho and Whatcom Steelhead programs
4	hatchery	completed	2014	Steelhead	Skykomish winter steelhead plant reduced from 250,000 to 167,000
4	Hatchery	In Progress	2014	Steelhead	Initiate Puget Sound segregated early-winter steelhead gene-flow monitoring program
4	Hatchery	In Progress	2019	Steelhead	Phase out Skamania summer steelhead stock in Puget Sound; establish Puget Sound summer steelhead broodstock using SF Skykomish River fish
4	hatchery	completed	various	Steelhead	The number of summer steelhead smolts released from Reiter Ponds on the Skykomish River averaged 250,000 in the years 2004-2008, 193,000 from 2011-2015, and was reduced to 116,000 in 2017.
5	Hatchery	In Progress	2001	Chum	Release fry into Duncan Creek
5	Hatchery	Completed	2002	Chum	Release fry into Grays River consistent with HSRG standards
5	Hatchery	In Progress	2012	Chum	Release fry into Lewis River
5	Fishery	Completed	2013	Chum	Retention of Chum not allowed in Columbia River commercial fisheries
5	Fishery	Completed	2013	Chum	Retention of Chum not allowed in Columbia River commercial fisheries
5	Fishery	Completed	2013	Chum	Retention of Chum not allowed in Columbia River commercial fisheries
5	Fishery	Completed	2013	Chum	Retention of Chum not allowed in Columbia River commercial fisheries

5	Fishery	Completed	2013	Chum	Retention of Chum not allowed in Columbia River commercial fisheries
5	Fishery	Completed	2013	Chum	Retention of Chum not allowed in Columbia River commercial fisheries
5	Fishery	Completed	2013	Chum	Retention of Chum not allowed in Columbia River commercial fisheries
5	Fishery	Completed	2013	Chum	Retention of Chum not allowed in Columbia River commercial fisheries
5	Fishery	Completed	2013	Chum	Retention of Chum not allowed in Columbia River commercial fisheries
5	Fishery	Completed	2013	Chum	Retention of Chum not allowed in Columbia River commercial fisheries
5	Hatchery	In Progress	2017	Chum	Release fry into Elochoman River
5	Fishery	Completed	1992-1995	Chum	Retention of Chum not allowed in Columbia River, including tributaries, sport fisheries
5	Fishery	Completed	1992-1995	Chum	Retention of Chum not allowed in Columbia River, including tributaries, sport fisheries
5	Fishery	Completed	1992-1995	Chum	Retention of Chum not allowed in Columbia River, including tributaries, sport fisheries
5	Fishery	Completed	1992-1995	Chum	Retention of Chum not allowed in Columbia River, including tributaries, sport fisheries
5	Fishery	Completed	1992-1995	Chum	Retention of Chum not allowed in Columbia River, including tributaries, sport fisheries
5	Fishery	Completed	1992-1995	Chum	Retention of Chum not allowed in Columbia River, including tributaries, sport fisheries

5	Fishery	Completed	1992-1995	Chum	Retention of Chum not allowed in Columbia River, including tributaries, sport fisheries
5	Fishery	Completed	1992-1995	Chum	Retention of Chum not allowed in Columbia River, including tributaries, sport fisheries
5	Fishery	Completed	1992-1995	Chum	Retention of Chum not allowed in Columbia River, including tributaries, sport fisheries
5	Fishery	Completed	1992-1995	Chum	Retention of Chum not allowed in Columbia River, including tributaries, sport fisheries
5	Hatchery	Completed	1996	Coho	Transport hatchery adults to Upper Cowlitz and Cispus rivers
5	Hatchery	Completed	1997	Coho	Transport hatchery adults to Tilton River
5	Fishery	In Progress	1998	Coho	Transport only natural origin adults to upstream of Sediment Retention Structure
5	Fishery	Completed	2001	Coho	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	2001	Coho	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	2001	Coho	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	2001	Coho	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	2001	Coho	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	2001	Coho	Conduct mark selective sport fisheries in lower Columbia tributaries

5	Fishery	Completed	2001	Coho	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	2001	Coho	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	2001	Coho	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	2001	Coho	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	2001	Coho	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	2001	Coho	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	2001	Coho	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	2001	Coho	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	2001	Coho	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Hatchery	Completed	2004	Coho	Eliminate smolt releases from Steamboat Slough
5	Hatchery	In Progress	2005	Coho	Annually transport up to 7,500-9,000 early/late adults to upper North Fork Lewis River, including both hatchery and natural origin adults
5	Hatchery	Completed	2008	Coho	Convert hatchery program from segregated to integrated
5	Hatchery	Completed	2008	Coho	Convert late stock hatchery program from segregated to integrated

5	Hatchery	Completed	2009	Coho	Convert hatchery program from out-of-basin early stock to in-basin late stock
5	Hatchery	In Progress	2009	Coho	Initiate integrated hatchery program using local broodstock
5	Hatchery	Completed	2009	Coho	Eliminate in-basin hatchery program
5	Hatchery	Planned	2009	Coho	Operate weir to remove hatchery fish
5	Hatchery	Completed	2009	Coho	Convert majority of program from early stock to late stock
5	Hatchery	Completed	2009	Coho	Reduce in-basin hatchery program
5	Hatchery	In Progress	2010	Coho	Reduce in-basin hatchery program
5	Hatchery	Completed	2010	Coho	Reduce in-basin hatchery program using early stock
5	Hatchery	Completed	2010	Coho	Increase in-basin hatchery program using late stock
5	Hatchery	In Progress	2010	Coho	Convert late stock hatchery program from segregated to integrated
5	Hatchery	In Progress	2012	Coho	Reduce in-basin hatchery program
5	Fishery	In Progress	2014	Coho	Initiate commercial fisheries using alternative gears
5	Fishery	In Progress	2014	Coho	Initiate commercial fisheries using alternative gears

5	Fishery	In Progress	2014	Coho	Initiate commercial fisheries using alternative gears
5	Fishery	In Progress	2014	Coho	Initiate commercial fisheries using alternative gears
5	Hatchery	Completed	2014	Coho	Remove hatchery fish handled at weirs in lower Cowlitz tributaries
5	Fishery	In Progress	2014	Coho	Initiate commercial fisheries using alternative gears
5	Fishery	In Progress	2014	Coho	Initiate commercial fisheries using alternative gears
5	Fishery	In Progress	2014	Coho	Initiate commercial fisheries using alternative gears
5	Fishery	In Progress	2014	Coho	Initiate commercial fisheries using alternative gears
5	Fishery	In Progress	2014	Coho	Initiate commercial fisheries using alternative gears
5	Fishery	In Progress	2014	Coho	Initiate commercial fisheries using alternative gears
5	Hatchery	Completed	2014	Coho	Eliminate in-basin hatchery program using early stock
5	Hatchery	Completed	2014	Coho	Reduce in-basin hatchery program using late stock
5	Hatchery	In Progress	2014	Coho	Convert late stock hatchery program from segregated to integrated
5	Fishery	In Progress	2014	Coho	Initiate commercial fisheries using alternative gears

5	Fishery	In Progress	2014	Coho	Initiate commercial fisheries using alternative gears
5	Fishery	In Progress	2014	Coho	Initiate commercial fisheries using alternative gears
5	Fishery	In Progress	2014	Coho	Initiate commercial fisheries using alternative gears
5	Fishery	In Progress	2014	Coho	Initiate commercial fisheries using alternative gears
5	Fishery	Completed	2015	Coho	Adopt abundance-based harvest matrix to set harvest rates on Lower Columbia Natural Coho
5	Fishery	Completed	2015	Coho	Adopt abundance-based harvest matrix to set harvest rates on Lower Columbia Natural Coho
5	Fishery	Completed	2015	Coho	Adopt abundance-based harvest matrix to set harvest rates on Lower Columbia Natural Coho
5	Fishery	Completed	2015	Coho	Adopt abundance-based harvest matrix to set harvest rates on Lower Columbia Natural Coho
5	Fishery	Completed	2015	Coho	Adopt abundance-based harvest matrix to set harvest rates on Lower Columbia Natural Coho
5	Fishery	Completed	2015	Coho	Adopt abundance-based harvest matrix to set harvest rates on Lower Columbia Natural Coho
5	Hatchery	In Progress	2015	Coho	Limit transportation of hatchery adults to Upper Cowlitz and Cispus rivers by only transporting offspring from integrated hatchery program
5	Fishery	Completed	2015	Coho	Adopt abundance-based harvest matrix to set harvest rates on Lower Columbia Natural Coho
5	Fishery	Completed	2015	Coho	Adopt abundance-based harvest matrix to set harvest rates on Lower Columbia Natural Coho

5	Fishery	Completed	2015	Coho	Adopt abundance-based harvest matrix to set harvest rates on Lower Columbia Natural Coho
5	Fishery	Completed	2015	Coho	Adopt abundance-based harvest matrix to set harvest rates on Lower Columbia Natural Coho
5	Fishery	Completed	2015	Coho	Adopt abundance-based harvest matrix to set harvest rates on Lower Columbia Natural Coho
5	Fishery	Completed	2015	Coho	Adopt abundance-based harvest matrix to set harvest rates on Lower Columbia Natural Coho
5	Fishery	Completed	2015	Coho	Adopt abundance-based harvest matrix to set harvest rates on Lower Columbia Natural Coho
5	Fishery	Completed	2015	Coho	Adopt abundance-based harvest matrix to set harvest rates on Lower Columbia Natural Coho
5	Fishery	Completed	2015	Coho	Adopt abundance-based harvest matrix to set harvest rates on Lower Columbia Natural Coho
5	Hatchery	In Progress	2017	Coho	Operate improved juvenile collection facility at Cowlitz Falls Dam
5	Hatchery	Completed	2018	Coho	Remove passage barrier at Elochoman Hatchery
5	Hatchery	In Progress	2018	Coho	Convert late stock hatchery program from integrated to segregated
5	Hatchery	In Progress	2019	Coho	Initiate integrated in-basin hatchery program
5	Hatchery	In Progress	2019	Coho	Reduce in-basin hatchery program
5	Hatchery	In Progress	2020	Coho	Reduce in-basin hatchery program

5	Hatchery	In Progress	2020	Coho	Reduce in-basin hatchery program
5	Fishery	In Progress	1998-2000	Coho	Implement mark selective sport fisheries in ocean
5	Fishery	In Progress	1998-2000	Coho	Implement mark selective sport fisheries in ocean
5	Fishery	In Progress	1998-2000	Coho	Implement mark selective sport fisheries in ocean
5	Fishery	In Progress	1998-2000	Coho	Implement mark selective sport fisheries in ocean
5	Fishery	In Progress	1998-2000	Coho	Implement mark selective sport fisheries in ocean
5	Fishery	In Progress	1998-2000	Coho	Implement mark selective sport fisheries in ocean
5	Fishery	In Progress	1998-2000	Coho	Implement mark selective sport fisheries in ocean
5	Fishery	In Progress	1998-2000	Coho	Implement mark selective sport fisheries in ocean
5	Fishery	In Progress	1998-2000	Coho	Implement mark selective sport fisheries in ocean
5	Fishery	In Progress	1998-2000	Coho	Implement mark selective sport fisheries in ocean
5	Fishery	In Progress	1998-2000	Coho	Implement mark selective sport fisheries in ocean
5	Fishery	In Progress	1998-2000	Coho	Implement mark selective sport fisheries in ocean

5	Fishery	In Progress	1998-2000	Coho	Implement mark selective sport fisheries in ocean
5	Fishery	In Progress	1998-2000	Coho	Implement mark selective sport fisheries in ocean
5	Fishery	In Progress	1998-2000	Coho	Implement mark selective sport fisheries in ocean
5	Hatchery	Completed	Late 1990's	Coho	No hatchery releases in basin
5	Hatchery	Completed	Late 1990's	Coho	No hatchery releases in basin
5	Hatchery	Completed	Late 1990's	Coho	No hatchery releases in basin
5	Hatchery	Completed	Late 1990's	Coho	No hatchery releases in basin
5	Hatchery	Completed	Late 1990's	Coho	No hatchery releases in basin
5	Hatchery	Completed	1997	Fall Chinook	Eliminate in-basin hatchery program
5	Hatchery	Completed	1999	Fall Chinook	Eliminate in-basin hatchery smolt releases
5	Hatchery	In Progress	2001	Fall Chinook	Transport hatchery adults to Tilton River
5	Hatchery	Completed	2008	Fall Chinook	Eliminate in-basin hatchery smolt releases
5	Hatchery	Completed	2009	Fall Chinook	Operate weir in Elochoman River to remove hatchery fish

5	Hatchery	In Progress	2009	Fall Chinook	Reduce in-basin hatchery program
5	Hatchery	In Progress	2009	Fall Chinook	Reduce in-basin hatchery program
5	Hatchery	Completed	2010	Fall Chinook	Transport hatchery adults to Upper Cowlitz and Cispus rivers
5	Hatchery	Completed	2010	Fall Chinook	Initiate integrated hatchery program
5	Hatchery	Completed	2010	Fall Chinook	Increase in-basin hatchery program
5	Fishery	In Progress	2011	Fall Chinook	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	In Progress	2011	Fall Chinook	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	In Progress	2011	Fall Chinook	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	2011	Fall Chinook	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	2011	Fall Chinook	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	2011	Fall Chinook	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	2011	Fall Chinook	Operate weir in Coweeman River to remove hatchery fish
5	Fishery	Completed	2011	Fall Chinook	Conduct mark selective sport fisheries in lower Columbia tributaries

5	Fishery	Completed	2011	Fall Chinook	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	2011	Fall Chinook	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	2011	Fall Chinook	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	2011	Fall Chinook	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	2011	Fall Chinook	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	In Progress	2011	Fall Chinook	Eliminate retention of fall Chinook salmon in sport fisheries in Lewis basin
5	Fishery	Completed	2012	Fall Chinook	Adopt abundance-based harvest matrix to set harvest rates on natural (tule) Chinook
5	Fishery	Completed	2012	Fall Chinook	Adopt abundance-based harvest matrix to set harvest rates on natural (tule) Chinook
5	Fishery	Completed	2012	Fall Chinook	Adopt abundance-based harvest matrix to set harvest rates on natural (tule) Chinook
5	Fishery	Completed	2012	Fall Chinook	Adopt abundance-based harvest matrix to set harvest rates on natural (tule) Chinook
5	Fishery	Completed	2012	Fall Chinook	Adopt abundance-based harvest matrix to set harvest rates on natural (tule) Chinook
5	Fishery	Completed	2012	Fall Chinook	Adopt abundance-based harvest matrix to set harvest rates on natural (tule) Chinook
5	Fishery	Completed	2012	Fall Chinook	Adopt abundance-based harvest matrix to set harvest rates on natural (tule) Chinook

5	Fishery	Completed	2012	Fall Chinook	Adopt abundance-based harvest matrix to set harvest rates on natural (tule) Chinook
5	Fishery	Completed	2012	Fall Chinook	Adopt abundance-based harvest matrix to set harvest rates on natural (tule) Chinook
5	Fishery	Completed	2012	Fall Chinook	Adopt abundance-based harvest matrix to set harvest rates on natural (tule) Chinook
5	Fishery	Completed	2012	Fall Chinook	Adopt abundance-based harvest matrix to set harvest rates on natural (tule) Chinook
5	Fishery	Completed	2012	Fall Chinook	Adopt abundance-based harvest matrix to set harvest rates on natural (tule) Chinook
5	Fishery	In Progress	2012	Fall Chinook	Adopt abundance-based harvest matrix
5	Fishery	In Progress	2013	Fall Chinook	Implement mark selective sport fisheries in ocean and lower Columbia River
5	Fishery	In Progress	2013	Fall Chinook	Implement mark selective sport fisheries in ocean and lower Columbia River
5	Fishery	In Progress	2013	Fall Chinook	Implement mark selective sport fisheries in ocean and lower Columbia River
5	Fishery	In Progress	2013	Fall Chinook	Implement mark selective sport fisheries in ocean and lower Columbia River
5	Hatchery	In Progress	2013	Fall Chinook	Reduce in-basin hatchery program
5	Hatchery	Completed	2013	Fall Chinook	Initiate integrated hatchery program
5	Fishery	In Progress	2013	Fall Chinook	Implement mark selective sport fisheries in ocean and lower Columbia River

5	Fishery	In Progress	2013	Fall Chinook	Implement mark selective sport fisheries in ocean and lower Columbia River
5	Fishery	In Progress	2013	Fall Chinook	Implement mark selective sport fisheries in ocean and lower Columbia River
5	Fishery	In Progress	2013	Fall Chinook	Implement mark selective sport fisheries in ocean and lower Columbia River
5	Fishery	In Progress	2013	Fall Chinook	Implement mark selective sport fisheries in ocean and lower Columbia River
5	Fishery	In Progress	2013	Fall Chinook	Implement mark selective sport fisheries in ocean and lower Columbia River
5	Fishery	In Progress	2013	Fall Chinook	Implement mark selective sport fisheries in ocean and lower Columbia River
5	Fishery	In Progress	2013	Fall Chinook	Implement mark selective sport fisheries in ocean and lower Columbia River
5	Fishery	In Progress	2013	Fall Chinook	Implement mark selective sport fisheries in ocean and lower Columbia River
5	Fishery	In Progress	2014	Fall Chinook	Initiate lower Columbia commercial fisheries using alternative gears
5	Fishery	In Progress	2014	Fall Chinook	Initiate commercial fisheries using alternative gears
5	Fishery	In Progress	2014	Fall Chinook	Initiate commercial fisheries using alternative gears
5	Fishery	In Progress	2014	Fall Chinook	Initiate commercial fisheries using alternative gears
5	Fishery	In Progress	2014	Fall Chinook	Initiate commercial fisheries using alternative gears

5	Fishery	In Progress	2014	Fall Chinook	Initiate commercial fisheries using alternative gears
5	Hatchery	Completed	2014	Fall Chinook	Operate weir in North Fork Toutle River to remove hatchery fish
5	Fishery	In Progress	2014	Fall Chinook	Initiate commercial fisheries using alternative gears
5	Fishery	In Progress	2014	Fall Chinook	Initiate commercial fisheries using alternative gears
5	Hatchery	Completed	2014	Fall Chinook	Initiate integrated hatchery program
5	Fishery	In Progress	2014	Fall Chinook	Initiate commercial fisheries using alternative gears
5	Fishery	In Progress	2014	Fall Chinook	Initiate commercial fisheries using alternative gears
5	Fishery	In Progress	2014	Fall Chinook	Initiate commercial fisheries using alternative gears
5	Hatchery	Completed	2014	Fall Chinook	Operate weir in Washougal River to remove hatchery fish
5	Hatchery	Completed	2014	Fall Chinook	Initiate integrated hatchery program
5	Fishery	In Progress	2014	Fall Chinook	Initiate commercial fisheries using alternative gears
5	Fishery	In Progress	2014	Fall Chinook	Initiate commercial fisheries using alternative gears
5	Hatchery	Completed	2015	Fall Chinook	Operate weir in lower Kalama River to remove hatchery fish (constructed in 2014-2015)

5	Hatchery	In Progress	2015	Fall Chinook	Further reduce in-basin hatchery program
5	Hatchery	Completed	2016	Fall Chinook	Operate weir in Grays River to remove hatchery fish (operated in 2016 not in 2017)
5	Hatchery	Planned	2016	Fall Chinook	Discontinue transportation of natural and hatchery origin to Upper Cowlitz and Cispus rivers
5	Hatchery	Completed	2016	Fall Chinook	Discontinue integrated hatchery program and operate segregated program
5	Hatchery	Completed	2017	Fall Chinook	Eliminate hatchery program in Deep River
5	Hatchery	Completed	2017	Fall Chinook	Increase in-basin hatchery program
5	Hatchery	In Progress	2018	Fall Chinook	Operate weir in Grays River to remove hatchery fish
5	Hatchery	Completed	2018	Fall Chinook	Remove passage barrier at Elochoman Hatchery
5	Hatchery	In Progress	2019	Fall Chinook	Reduce in-basin hatchery program
5	Hatchery	In Progress	2019	Fall Chinook	Operate weir in Cedar Creek to remove hatchery fish
5	Hatchery	In Progress	2020	Fall Chinook	Reduce in-basin hatchery program
5	Hatchery	In Progress	2021	Fall Chinook	Reduce in-basin hatchery program
5	Fishery	Completed	2001	Spring Chinook	Conduct mark selective sport fisheries in lower Columbia tributaries

5	Fishery	In Progress	2001	Spring Chinook	Conduct mark selective commercial fisheries in lower Columbia
5	Fishery	Completed	2001	Spring Chinook	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	In Progress	2001	Spring Chinook	Conduct mark selective commercial fisheries in lower Columbia
5	Fishery	Completed	2001	Spring Chinook	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	In Progress	2001	Spring Chinook	Conduct mark selective commercial fisheries in lower Columbia
5	Fishery	Completed	2001	Spring Chinook	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	In Progress	2001	Spring Chinook	Conduct mark selective commercial fisheries in lower Columbia
5	Fishery	Completed	2001	Spring Chinook	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	In Progress	2001	Spring Chinook	Conduct mark selective commercial fisheries in lower Columbia
5	Hatchery	In Progress	2002	Spring Chinook	Transport hatchery adults to Upper Cowlitz and Cispus rivers, no spring chinook transported to Tilton River
5	Hatchery	In Progress	2003	Spring Chinook	Eliminate smolt releases in Toutle River
5	Hatchery	In Progress	2006	Spring Chinook	Transport hatchery adults to upper Lewis River above Swift Dam
5	Hatchery	In Progress	2012	Spring Chinook	Eliminate smolt releases in Upper Cowlitz and Cispus rivers

5	Hatchery	Completed	2012	Spring Chinook	Had a small integrated program for upriver juvenile supplementation that ended after 2017, now all NOR adults placed in upper basin, may restart integrated program once adult returns and collection at Swift improves
5	Hatchery	In Progress	2013	Spring Chinook	Initiate smolt releases into upper Lewis River above Swift Dam
5	Hatchery	In Progress	2017	Spring Chinook	Operate improved juvenile collection facility at Cowlitz Falls Dam
5	Hatchery	Completed	2000	Summer Steelhead	Reduce in-basin hatchery program
5	Hatchery	Completed	2009	Summer Steelhead	Reduce hatchery releases using out-of-stratum stock
5	Hatchery	In Progress	2010	Summer Steelhead	Reduced in-basin hatchery program
5	Hatchery	In Progress	2011	Summer Steelhead	Operate fish ladder at Washougal Hatchery to improve upstream passage
5	Hatchery	Completed	2014	Summer Steelhead	Eliminate hatchery releases using out-of-stratum stock
5	Hatchery	In Progress	2014	Summer Steelhead	Increase in-basin hatchery program
5	Hatchery	In Progress	2017	Summer Steelhead	Convert broodstock to locally adapted hatchery stock for segregated hatchery program
5	Hatchery	In Progress	2017	Summer Steelhead	Operate weir to remove hatchery fish at Skamania Hatchery
5	Hatchery	In Progress	?	Summer Steelhead	Initiate integrated hatchery program
5	Hatchery	In Progress	?	Summer Steelhead	Transport only natural origin steelhead upstream of Kalama Falls Hatchery

5	Hatchery	In Progress	2017-2022	Summer Steelhead	Convert hatchery program from segregated to integrated
5	Hatchery	In Progress	2017-2022	Summer Steelhead	Convert hatchery program from out-of-stratum to in-stratum stock
5	Fishery	Completed	mid-1980's	Summer Steelhead	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	mid-1980's	Summer Steelhead	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	mid-1980's	Summer Steelhead	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	mid-1980's	Summer Steelhead	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Hatchery	In Progress	1989	Winter Steelhead	Transport only natural origin adults to upstream of Sediment Retention Structure
5	Hatchery	Completed	1999	Winter Steelhead	Eliminate releases in Mill and Germany Creeks
5	Hatchery	Completed	2000	Winter Steelhead	Reduce in-basin hatchery program
5	Hatchery	Completed	2008	Winter Steelhead	Eliminate transportation of hatchery adults to Upper Cowlitz and Cispus rivers
5	Hatchery	In Progress	2008	Winter Steelhead	Initiate integrated late winter hatchery program
5	Hatchery	In Progress	2009	Winter Steelhead	Eliminate smolt and fry releases in Upper Cowlitz and Cispus rivers
5	Hatchery	Completed	2009	Winter Steelhead	Reduce in-basin hatchery program

5	Hatchery	Completed	2009	Winter Steelhead	Reduce hatchery releases using out-of-stratum stock
5	Hatchery	In Progress	2011	Winter Steelhead	Operate fish ladder at Washougal Hatchery to improve upstream passage
5	Hatchery	In Progress	2012	Winter Steelhead	Transport hatchery adults to upper North Fork Lewis River
5	Hatchery	In Progress	2012	Winter Steelhead	Limit transportation of hatchery adults to Upper Upper North Fork Lewis River by only transporting offspring from integrated hatchery program
5	Hatchery	Completed	2013	Winter Steelhead	Eliminate in-basin early winter hatchery program
5	Hatchery	In Progress	2013	Winter Steelhead	Increase in-basin late winter hatchery program
5	Hatchery	In Progress	2013	Winter Steelhead	Initiate integrated hatchery program
5	Hatchery	Completed	2014	Winter Steelhead	Initiate recycling of summer steelhead
5	Hatchery	In Progress	2014	Winter Steelhead	Convert late winter hatchery program from out-of-stratum to in-basin stock
5	Hatchery	In Progress	2014	Winter Steelhead	Convert late winter hatchery program from segregated to integrated
5	Hatchery	Completed	2014	Winter Steelhead	Operate weirs in selected tributaries to remove hatchery fish
5	Hatchery	Completed	2014	Winter Steelhead	Transport hatchery origin adults to Upper Cowlitz and Cispus rivers
5	Hatchery	Completed	2014	Winter Steelhead	Eliminate in-basin hatchery program

5	Hatchery	In Progress	2014	Winter Steelhead	Reduce in-basin hatchery program
5	Fishery	Completed	2014	Winter Steelhead	Expanded area open to sport fishing to increase harvest of hatchery fish
5	Hatchery	Completed	2014	Winter Steelhead	Eliminate hatchery releases using out-of-stratum stock
5	Hatchery	Completed	2014	Winter Steelhead	Increase hatchery releases using out-of-stratum stock
5	Hatchery	In Progress	2014	Winter Steelhead	Increase size of in-basin segregated hatchery program
5	Hatchery	In Progress	2015	Winter Steelhead	Limit transportation of hatchery adults to Upper Cowlitz and Cispus rivers by only transporting offspring from integrated hatchery program
5	Hatchery	Completed	2016	Winter Steelhead	Eliminate in-basin hatchery program
5	Hatchery	In Progress	2017	Winter Steelhead	Increase size of in-basin segregated hatchery program
5	Hatchery	In Progress	2017	Winter Steelhead	Operate improved juvenile collection facility at Cowlitz Falls Dam
5	Hatchery	Completed	2017	Winter Steelhead	Convert segregated hatchery program from out-of-stratum to in-stratum stock
5	Hatchery	In Progress	2017	Winter Steelhead	Increase size of in-basin segregated hatchery program
5	Hatchery	In Progress	2017	Winter Steelhead	Operate weir to remove hatchery fish at Skamania Hatchery
5	Hatchery	In Progress	?	Winter Steelhead	Initiate integrated hatchery program

5	Hatchery	In Progress	?	Winter Steelhead	Transport only natural origin steelhead upstream of Kalama Falls Hatchery
5	Hatchery	In Progress	2017-2022	Winter Steelhead	Convert segregated hatchery program from out-of-stratum to in-basin stock
5	Hatchery	In Progress	2017-2022	Winter Steelhead	Convert segregated hatchery program from out-of-stratum to in-stratum stock
5	Hatchery	In Progress	2017-2022	Winter Steelhead	Convert segregated hatchery program from out-of-stratum to in-stratum stock
5	Fishery	Completed	mid-1980's	Winter Steelhead	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	mid-1980's	Winter Steelhead	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	mid-1980's	Winter Steelhead	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	mid-1980's	Winter Steelhead	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	mid-1980's	Winter Steelhead	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	mid-1980's	Winter Steelhead	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	mid-1980's	Winter Steelhead	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	mid-1980's	Winter Steelhead	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	mid-1980's	Winter Steelhead	Conduct mark selective sport fisheries in lower Columbia tributaries

5	Fishery	Completed	mid-1980's	Winter Steelhead	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	mid-1980's	Winter Steelhead	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	mid-1980's	Winter Steelhead	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	mid-1980's	Winter Steelhead	Conduct mark selective sport fisheries in lower Columbia tributaries
5	Fishery	Completed	mid-1980's	Winter Steelhead	Conduct mark selective sport fisheries in lower Columbia tributaries
6	Hatchery	Completed	2003	All	Discontinue pooling gametes to maximize effective population size for hatchery spawners
6	Hatchery	Completed	2005	All	Implement mass-marking for all anadromous salmon and steelhead releases (Adipose clip, otolith mark and/ or tag)
6	Hatchery	Completed	2014	All	New intake on Stevens Creek at Humptulips Hatchery
6	Hatchery	Completed		Chum	Discontinue Garrison Springs chum program
6	Hatchery	Completed	2004	Coho	Discontinue Bear River Coho program
6	Hatchery	Completed	2009	Coho	Coho scale sampling to determine early vs late run and hatchery vs. natural abundance in broodstock
6	Hatchery	Completed	2009	Coho	Sol Duc Fall Coho program reduced from 500k to 425k
6	Hatchery	Completed	2009	Coho	Humptulips Fall Coho program reduced from 875k to 400k

6	Hatchery	Completed	2009	Coho	Mayr Bros Coho program reduced to 300k; installed weir and trap at the intake and on-station releases only to lower pHOS
6	Hatchery	Completed	2014	Coho	Forks Creek late and normal Coho initiate active off-station broodstock collection using tributaries
6	Hatchery	Completed	2014	Coho	Humptulips Late and Normal Coho increase NOB's and reduce straying, explore selective harvest opportunities
6	Hatchery	Completed		Coho	Discontinue Fox Island Coho program
6	Hatchery	Completed	2015	Fall Chinook	Reduce Forks Creek Chinook program from 3,200,000 to 350,000
6	Hatchery	Completed	2003	Fall Chinook	Reinstitute index stock tagging of Forks Creek Fall Chinook
6	Hatchery	Completed	2008	Fall Chinook	Eliminate Lakewood and Tumwater Falls Yearling Chinook programs
6	Fishery	Completed	2011	Fall Chinook	Initiate Nisqually alternative fishing gear study
6	Fishery	Completed	2011	Fall Chinook	Co-managers reduced Sol Duc Chinook fishery to 29 hours, natural fish release for non-tribal
6	Fishery	Completed	2011	Fall Chinook	Naselle adult weir to divert all fish into hatchery
6	Hatchery	In Progress	2017	Fall Chinook	Initiate release time study for Garrison Springs Fall Chinook
6	Hatchery	Planned	2020	Fall Chinook	Initiate release time study for Minter Creek Fall Chinook
6	Hatchery	Planned	2020	Fall Chinook	Initiate release time study for Hoodsport Fall Chinook

6	Hatchery	Planned	2020	Fall Chinook	Initiate broodstock selection study for Forks Creek Hatchery Fall Chinook
6	Hatchery	Completed		Fall Chinook	Discontinue McAllister Hatchery fall Chinook program
6	Hatchery	Completed		Fall Chinook	Discontinue Coulter Creek fall Chinook program
6	Hatchery	Completed		Fall Chinook	Discontinue Fox Island fall Chinook program
6	Hatchery	Completed		Fall Chinook	Discontinue Big Beef Creek fall Chinook program
6	Hatchery	Completed		Pink	Discontinue Minter Creek pink program
6	Hatchery	Completed	2013	Spring Chinook	Dungeness Spring Chinook: employing release location mod to increase spatial distribution, increased minimal flows, current land acquisitions in 2013.
6	Hatchery	In Progress	2009	Steelhead	Initiate segregated early-winter steelhead cutoff of 1/31 for egg take, no out-of-basin egg transfers, run traps through April or May (facility dependent), no off-station plants.
6	Hatchery	Completed	2010	Steelhead	In river broodstock collection implemented for late-winter steelhead program
6	Hatchery	Completed	2012	Steelhead	Establish Wild Steelhead Management Zone in the Sol Duc River; integrated steelhead program moved to Bogachiel
6	Hatchery	Completed	2012	Steelhead	Transition all segregated steelhead program is in Puget Sound to volitional release; non-migrating smolts planted in landlocked lakes
6	Hatchery	Completed	2013	Steelhead	Establish Wild Steelhead Management Zone in the Nisqually River
6	Hatchery	Completed	2013	Steelhead	Establish Wild Steelhead Management Zone in the Elwha River once conservation program sunsets

6	Hatchery	In Progress	2014	Steelhead	Initiate Puget Sound segregated early-winter steelhead gene-flow monitoring program
6	Hatchery	Planned	?	Summer Chinook	Sol Duc Summer Chinook: Highly integrated 50K release at Bear Springs, CWT only. Need to rework the hatchery creek approach to provide more attraction to the facility.
6	Hatchery	Completed	2009		Sol Duc Spring Chinook program discontinued, and program converted to integrated Summer Chinook
6	Hatchery	Completed	2014		Establish recovery phase designation for natural populations associated with hatchery programs