HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Cathlamet Channel Net Pen Spring Chinook Program (Segregated)
Species or Hatchery Stock:	Spring Chinook *(Oncorhynchus tshawytscha*) Cowlitz Salmon Hatchery and/or Lewis River Hatchery Stock
Agency/Operator:	Washington Department of Fish and Wildlife
Watershed and Region:	Lower Columbia River
Date Submitted:	
Date Last Updated:	September 3, 2013

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Cathlamet Channel Net Pen Spring Chinook Program.

1.2) Species and population (or stock) under propagation, and ESA status.

Cowlitz River spring Chinook salmon (*Oncorhynchus tshawytscha*).
ESA Status: *Threatened* (for Cowlitz stock) reaffirmed threatened by five-year status review, completed August 15, 2011 (76 FR 50448).

Lewis River spring Chinook salmon (Oncorhynchus tshawytscha).
ESA Status: *Threatened* (for Lewis stock) reaffirmed threatened by five-year status review, completed August 15, 2011 (76 FR 50448).

1.3) Responsible organization and individuals

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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

NOAA-National Marine Fisheries Service (NMFS) – Manager of Mitchell Act Funds.

1.4) Funding source, staffing level, and annual hatchery program operational costs.

Funding Sources	Operation Information
Mitchell Act	Full time equivalent staff –supplied from Grays River and Beaver Creek facilities Annual operating cost (dollars) - $257,000

1.5) Location(s) of hatchery and associated facilities.

Broodstock Source:
Cowlitz River Spring Chinook Stock (Cowlitz Salmon Hatchery)

Lewis River Spring Chinook (Speelyai Hatchery)

Broodstock Collection Locations:

Cowlitz Salmon Hatchery:	Cowlitz River (WRIA 26.0002) at RKm 78.8; tributary to the Columbia River at RKm 109.4), Lower Columbia River, Washington.
Lewis River Hatchery Trap:	NF Lewis River (WRIA 27.0168) at RKm 20.9; Lewis Sub-basin
Merwin Trap:	NF Lewis River (WRIA 27.0168) at RKm 25.8; Lewis Sub-basin

Adult Holding; Spawning Locations:
Cowlitz Salmon Hatchery (CSH)

Speelyai Hatchery: Located on Speelyai Creek (WRIA 07.0431), tributary to NF Lewis River (WRIA 27.0168) at RKm 45.1; Lewis Sub-basin

Incubation and Rearing Location:

Grays River Hatchery: West Fork Grays River (WRIA 25.0130) at RKm 3.2; tributary to the Grays River (WRIA 25.0093) at RKm 20.9; tributary to the Columbia River at RKm 37.0, Lower Columbia River, Washington.

Acclimation; Release Location:

Cathlamet Channel net pens: Located in Cathlamet Channel on the Columbia River at RKm 64.3; near the confluence with Birnie Creek (WRIA 25.0281), tributary to the Columbia River at RKm. 62.9.

1.6) Type of program.

Segregated Harvest

1.7) Purpose (Goal) of program.

Mitigation/Augmentation. The goal of this program is to support fisheries in the basin and lower Columbia River, while eliminating a directed harvest on wild fish. Also serves as mitigation for development (including hydro-power) and habitat degradation.

1.8) Justification for the program.

The program is funded through the Mitchell Act via NOAA-NMFS for the purpose of mitigation for lost fish production due to development within the Columbia River Basin. WDFW protects listed fish and provides harvest opportunity on hatchery fish through the Lower Columbia River-approved Fish Management and Evaluation Plan (FMEP) (WDFW 2001). The Mitchell Act programs are intended to support Northwest fishing economies – particularly coastal and Native American -- that have relied on Columbia River production both before and after dam construction. Catches of hatchery fish sustain the economies of local communities while keeping incidental mortalities of ESA-listed fish at approved levels. The value of hatchery production and its benefit to local economies will be further increased by implementing fisheries that increase harvest of hatchery produced fish, as expected through implementation of the Lower Columbia Salmon Recovery Plan (LCSRP).

To minimize impacts on listed fish by WDFW facilities operation and the Cathlamet Channel Net Pen program, the following Risk Aversions are included in this HGMP:

Table 1.8.1: Summary of risk aversion measures for the Cathlamet Channel net pens program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.2	*Operation of Net Pen Facilities:* Currently there are is no permit process for freshwater net pen projects in Washington State. WDFW is obtaining the necessary permits for installing these net pens, however, the program does not require the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit; production is <20,000 lbs total on site production and <5,000 lbs of fish feed per month.
Intake Screening		
Effluent Discharge		
Broodstock Collection & Adult Passage	7.9	All fish are mass-marked prior to release. Broodstock collection and sorting procedures can quickly identify listed non-target listed fish, and if encountered, released per protocol to minimize impact as determined by WDFW Region 5 staff. See also Cowlitz and Lewis River Spring Chinook HGMPs.

Disease Transmission	7.9, 10.11	*Fish Health Policy in the Columbia Basin*. Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).
Competition & Predation	2.2.3, 10.11	Current risk aversions and future considerations are being reviewed and evaluated for further minimizing impacts to listed fish.

1.9) List of program "Performance Standards".

See HGMP section 1.10. Standards and indicators are referenced from Northwest Power Planning Council (NPPC) Artificial Production Review (APR) (NPPC 2001).

1.10) List of program "Performance Indicators", designated by "benefits" and "risks."

1.10.1) "Performance Indicators" addressing benefits.

Table 1.10.1.1: "Performance Indicators" addressing benefits.

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.1.2: Program contributes to mitigation requirements.	This program provides mitigation for lost fish production due to development within the Columbia River Basin and contributes to a meaningful harvest in sport and commercial fisheries.	Survival and contribution to fisheries will be estimated for each brood year released.
3.1.3: Program addresses ESA responsibilities.	Program is allowed to continue harvest under ESA permits.	Compliance with ESA is managed with sport fishery regulations that minimize impacts to ESA-listed steelhead and are monitored by WDFW law enforcement officers. Wild populations are monitored annually to assess trends and compare with goals. The FMEP outlines anticipated encounter rates and expected mortality rates for these fisheries. Creel surveys are being implemented to verify these.
3.2.1: Harvest of hatchery-produced fish minimizes impact to wild populations.	Harvest is regulated to meet appropriate biological assessment criteria. Mass mark juvenile hatchery fish prior to release to enable state agencies to implement selective fisheries.	Harvests are monitored by agencies to provide up-to-date information.
3.3.2: Releases are sufficiently marked to allow statistically significant evaluation of program contribution to natural production, and to evaluate effects of the program on the local natural population.	Percentage of total hatchery releases are identifiable as hatchery-origin fish. Mass-mark (adipose-fin clip, CWT, otolith-mark, other, etc., depending on species) production fish to identify them from naturally produced fish.	Annual estimates of mass-mark rate of all hatchery releases.

3.4.1: Implement measures for broodstock management to maintain integrity and genetic diversity.	A minimum of 300 hatchery adults are collected throughout the spawning run in proportion to timing, age and sex composition of return.	Annual run timing, age and sex composition and return timing data are collected (see Cowlitz and Lewis Spring Chinook HGMPs). Adhere to HSRG Guidelines (2004) and WDFW spawning guidelines. (Seidel 1983).
3.8.3: Non-monetary societal benefits for which the program is designed are achieved.	Recreational fishery angler days, length of season, number of licenses purchased.	Annual harvest of hatchery fish based on CWT recovery estimates and creel surveys.

1.10.2) "Performance Indicators" addressing risks.

Table 1.10.2.1: "Performance Indicators" addressing risks.

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.2.1. Harvest of hatchery-produced fish minimizes impact to wild populations.	Harvest is regulated to meet appropriate biological assessment criteria. Mass mark juvenile hatchery fish prior to release to enable state agencies to implement selective fisheries.	Harvests are monitored by agencies to provide up-to-date information.
3.2.2 Release groups are marked in a manner consistent with information needs and protocols to estimate impacts to natural and hatchery origin fish.	Percentage of total hatchery releases are identifiable as hatchery-origin fish. Mass-mark (adipose-fin clip, CWT, otolith-mark, other, etc., depending on species) production fish to identify them from naturally produced fish for selective fisheries.	Annual harvest of mass-marked hatchery fish based on CWT recovery estimates and creel surveys.
3.4.2 Broodstock collection does not significantly reduce potential juvenile production in natural rearing areas.	Number of spawners of natural-origin removed for broodstock.	Broodstock not collected at this site; see Cowlitz and Lewis Spring Chinook HGMPs.
3.5.1 Patterns of genetic variation within and among natural populations do not change significantly as a result of artificial production.	Within and between populations, genetic structure is not affected by artificial production.	Program began in 2012. See HGMP section 11 for M&E information.
3.5.3 Artificially-produced adults in natural production areas do not exceed appropriate proportion of the total natural spawning population.	The ratio of observed and/or estimated total numbers of artificially-produced fish on natural spawning grounds, to total number of naturally-produced fish (pHOS).	A portion of this program will be CWT'd to determine pHOS. WDFW plans to operate a weir in the Elochoman River during the spring and fall Chinook return timeframe (see HGMP sections 7.9 and 11.1.1). pHOS <0.10.
3.5.4 Juveniles are released on-station or after sufficient acclimation to maximize homing ability to intended return locations.	Fish are released in lower river locations after acclimation per WDFW Steelhead Rearing Guidelines (Tipping 2001).	Annual release information (type-acclimation, and location-on-station) are recorded in hatchery data systems (WDFW *Hatcheries Headquarters Database*).

3.5.5 Juveniles are released at fully-smolted stage.	Level of smoltification at release. Release type (forced, volitional or direct)	Fish are released at 10 fpp per WDFW rearing guidelines.
3.7.1 Artificial production facilities are operated in compliance with all applicable fish health guidelines, facility operation standards and protocols including IHOT, Co-managers Fish Health Policy and drug usage mandates from the Federal Food and Drug Administration.	Annual reports indicating levels of compliance with applicable standards and criteria. Periodic audits indicating level of compliance with applicable standards and criteria.	Pathologists from WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed (see Cowlitz and Lewis Spring Chinook HGMPs and Grays River Hatchery HGMP).
3.7.2 Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring.	Discharge water quality compared to applicable water quality standards by NPDES permit. WDFW water right permit compliance.	Not applicable at this site (see HGMP section 4.2).
3.7.3 Water withdrawals and in-stream water diversion structures for hatchery facility will not affect spawning behavior of natural populations or impact juveniles.	Water withdrawals compared to NMFS, USFWS and WDFW applicable passage and screening criteria for juveniles and adults.	Not applicable at this site (see HGMP section 4.2).
3.7.4 Prevent introduction, spread or amplification of fish pathogens. Follow Co-managers Fish Health Disease Policy (WDFW and WWTIT 1998, revised 2006).	Certification of fish health during rearing and immediately prior to release, including pathogens presence and virulence.	WDFW Fish Health Section inspects adult broodstock yearly for pathogens and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.
	• Release and/or transfer exams for pathogens and parasites.	1 to 6 weeks prior to transfer or release, fish are examined in accordance with the Co-managers Fish Health Policy.
	• Inspection of adult broodstock for pathogens and parasites.	At spawning, lots of 60 adult broodstock are examined for pathogens.
	• Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens and parasites.	Controls of specific fish pathogens through eggs/fish movements are conducted in accordance to Co-managers Fish Health Disease Policy (WDFW and WWTIT 1998, updated 2006).
3.7.6 Adult broodstock collection operation does not significantly alter spatial and temporal distribution of any naturally-produced population.	Spatial and temporal spawning distribution of natural populations above and below weir/trap currently compared to historic distribution.	Broodstock not collected at this site; see Cowlitz and Lewis Spring Chinook HGMPs.

3.7.8 Predation by hatchery fish does not significantly reduce numbers of natural fish.	Hatchery juveniles are raised to smolt-size and released from the hatchery at a time that fosters rapid migration downstream.	Recent WDFW research (Sharpe et al 2008) has shown that the predation risk from hatchery steelhead smolt releases are minimal on smaller prey fish

1.11) Expected size of program.

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).

Program receives a total of 268,000 green eggs from Cowlitz Salmon Hatchery. To meet this goal around 85 pairs of spawning adults need to be collected annually, based on an average fecundity of 3,920 eggs/female and pre-spawning mortality of 10%. This is in conjunction with broodstock collection for the Cowlitz spring Chinook program, which requires an egg-take of around 2.7-million (see Cowlitz Spring Chinook HGMP). Lewis River spring Chinook will be used as a backup source for this program (see Lewis Spring Chinook HGMP).

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.

Table 1.11.2.1: Proposed annual fish releases.

Age Class	Max. No.	Size (fpp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Watershed	Eco-province
Yearling	250,000	10	April/ May	Cathlamet Channel	40	Columbia Estuary	Columbia River Estuary

Source: Future Brood Document 2013

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

This spring Chinook program was initiated in 2012; first releases will occur in 2014. Currently no return data is available for these releases.

1.13) Date program started (years in operation), or is expected to start.

The Chinook program was initiated in 2012. The net pen facility has been operating since 2013.

1.14) Expected duration of program.

The program is on-going with no planned termination.

1.15) Watersheds targeted by program.

Fish are released in Cathlamet Channel, which is located on the lower mainstem Columbia River, at the confluence with Birnie Creek (WRIA 25.0281) (tributary to the Columbia River at RKm. 62.9), Elochoman Sub-Basin, Columbia River Estuary.

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

1.16.1 Brief Overview of Key Issues:

Program will be evaluated to determine if returning adults are straying into Lower Columbia tributaries.

1.16.2 Potential Alternatives to the Current Program:

Alternative 1: *Eliminate the program*. This action would reduce potential interaction with natural populations and eliminate potential impacts on other ESA-listed species. This program supports popular sport and commercial fisheries in the Lower Columbia, and is consistent with the mitigation responsibility of the Mitchell Act program requirements.

Alternative 2: Use local hatchery stocks. The Elochoman River (Beaver Creek Hatchery) does not have a hatchery spring Chinook program. This action would require development of a local hatchery broodstock program, including adult collection facilities, acclimation and monitoring sites.

Alternative 3: Locate program at Beaver Creek Hatchery. This would require establishing a hatchery spring Chinook program in the Elochoman system (see *Alternative 2*).

Alternative 4: Locate net pen in old waste water treatment plant. The old Cathlamet Wastewater Treatment Plant, located on the Columbia River floodplain, off Cathlamet Channel adjacent to Birnie Creek (WRIA 25.0281), has been decommissioned. The site, with its existing sewage lagoons, has been proposed as a possible alternative future net pen site. However, the Town of Cathlamet waterfront redevelopment proposals favor turning the site into a new moorage basin to the Elochoman Marina, or additional parkland.

1.16.3 Potential Reforms and Investments:

None.

SECTION 2. PROGRAM EFFECTS ON NMFS ESA-LISTED SALMONID POPULATIONS. (USFWS ESA-Listed Salmonid Species and Non-Salmonid Species are addressed in Addendum A)

2.1) List all ESA permits or authorizations in hand for the hatchery program.

None currently. This HGMP is submitted to the NOAA Fisheries for ESA consultation and take prohibition exemption under ESA section 7.

2.2) Provide descriptions, status, and projected take actions and levels for NMFS ESA-listed natural populations in the target area.

2.2.1) Description of NMFS ESA-listed salmonid population(s) affected by the program.

- Identify the NMFS ESA-listed population(s) that will be directly affected by the program.

None directly – this is a segregated program.

- Identify the NMFS ESA-listed population(s) that may be incidentally affected by the program.

Lower Columbia River Chinook (*Oncorhynchus tshawytscha*). Listed as "threatened" on March 24, 1999 (64FR14308); threatened status reaffirmed on June 28, 2005 (70FR37160); reaffirmed threatened by five-year status review, completed August 15, 2011 (76 FR 50448).

Lower Columbia River steelhead (*Oncorhynchus mykiss*). Listed as a threatened species on March 19, 1998 (63FR13347); threatened status reaffirmed on January 5, 2006 (70FR37160); reaffirmed threatened by five-year status review, completed August 15, 2011 (76 FR 50448).

Lower Columbia River coho (*Oncorhynchus kisutch*). Identified as a candidate species on June 25, 1995 (60FR38011). Listed as threatened on June 28, 2005 (70FR37160); reaffirmed threatened by five-year status review, completed August 15, 2011 (76 FR 50448).

Columbia River chum salmon (*Oncorhynchus keta*). Listed as threatened on March 25, 1999 (64FR14507); threatened status reaffirmed on June 28, 2005 (70FR37160); reaffirmed threatened by five-year status review, completed August 15, 2011 (76 FR 50448).

Elochoman River eulachon (*Thaleichthys pacificus):* The Southern Distinct Population Segment (DPS) of Pacific eulachon was listed as *Threatened* under the ESA on May 17, 2010 (75 FR 13012).

2.2.2) Status of NMFS ESA-listed salmonid population(s) affected by the program.

- Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds (*see definitions in "Attachment 1").*

Lower Columbia River Chinook The Lower Columbia River Chinook ESU includes all naturally spawned populations of Chinook salmon from the Columbia River and its tributaries from its mouth at the Pacific Ocean upstream to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River, and includes the Willamette River to Willamette Falls, Oregon, exclusive of spring-run Chinook salmon in the Clackamas River (64 FR 14208; March 24, 1999). Seventeen artificial propagation programs are considered to be part of the ESU, including (in Washington) the Elochoman River Tule Chinook Program, Cowlitz Tule Chinook Program, North Fork Toutle Tule Chinook Program, Kalama Tule Chinook Program, Washougal River Tule Chinook Program, Cowlitz spring Chinook Program in the Upper Cowlitz River and the Cispus River, Friends of the Cowlitz spring Chinook Program, Kalama River spring Chinook Program, Lewis River spring Chinook Program. NOAA has determined that these artificially propagated stocks are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the ESU (NMFS, 2005).

Status: Of the 32 historical populations in the ESU, 28 are considered extirpated or at very high risk (Ford 2011). Dam construction eliminated habitat for a number of populations leading to the extirpation of spring Chinook salmon populations in the Upper Cowlitz, Cispus, Tilton, North Fork Lewis , Big White Salmon rivers, and fall Chinook populations in the Upper Cowlitz and Big White Salmon rivers (SHIEER, NMFS 2004). Projects to allow access have been initiated in the Cowlitz and Lewis systems but these are not close to producing self-sustaining populations; Condit Dam on the Big White Salmon River was breached October 26, 2011. Based on the recovery plan analyses, all of the 14 Tule populations (Table 2.2.2.1) are considered very high risk except one that is considered at high risk. The modeling conducted in association with Tule harvest management suggests that three of the populations (Coweeman, Lewis and Washougal) are at a somewhat lower risk. The Lewis River late-fall population is considered low or very low risk (Ford 2011).

Table 2.2.2.1. Baseline viability status, viability and abundance objectives, and productivity improvement targets for lower Columbia River Chinook populations.

		Baseline viability					Prod.	Abundance		
Population	Contribution	A&P	S	D	Net	Obj.	target	Historical	Baseline	Target
Coast Fall										
Grays/Chinook	Contributing[2]	VL	H	VL	VL[2]	M+	+500%	800	<50	1,000
Eloch/Skam [C]	Primary	VL	H	L	VL[2]	H	+150%	3,000	<50	1,500
Mill/Aber/Germ	Primary[1]	VL	H	L	VL[2]	H	+155%	2,500	50	900
Youngs Bay (OR)	Stabilizing	--[3]	--[3]	--[3]	L	L	--[3]	--[3]	--[3]	--[3]
Big Creek (OR) [C]	Contributing[1]	--[3]	--[3]	--[3]	VL	L	--[3]	--[3]	--[3]	--[3]
Clatskanie (OR)	Primary	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]
Scappoose (OR)	Primary[1]	--[3]	--[3]	--[3]	L	H	--[3]	--[3]	--[3]	--[3]
Cascade Fall										
Lower Cowlitz [C]	Contributing	VL	H	M	VL[2]	M+	+50%	24,000	500	3,000
Upper Cowlitz	Stabilizing	VL	VL	M	VL	VL	--	28,000	0	--
Toutle[C]	Primary[1]	VL	H	M	VL[2]	H+	+265%	11,000	<50	4,000
Coweeman [G]	Primary	VL	H	H	VL[2]	H+	+80%	3,500	100	900
Kalama	Contributing[2]	VL	H	M	VL[2]	M	+110%	2,700	<50	500
Lewis [G]	Primary	VL	H	H	VL[2]	H+	+280%	2,600	<50	1,500
Salmon	Stabilizing	VL	H	M	VL	VL	--	n/a	<50	--
Washougal	Primary	VL	H	M	VL[2]	H+	+190%	2,600	<50	1,200
Clackamas (OR) [C]	Contributing	--[3]	--[3]	--[3]	VL	M	--[3]	--[3]	--[3]	--[3]
Sandy (OR)	Contributing[1]	--[3]	--[3]	--[3]	VL	M	--[3]	--[3]	--[3]	--[3]
Cascade L Fall										
Lewis NF [C,G]	Primary	VH	H	H	VH[1]	VH	0%	23,000	7,300	7,300
Sandy (OR) [C,G]	Primary	--[3]	--[3]	--[3]	H	VH	--[3]	--[3]	--[3]	--[3]
Cascade Spring										
Upper Cowlitz [C,G]	Primary	VL	L	M	VL[2]	H+	>500%	22,000	300	1,800
Cispus [C,G]	Primary	VL	L	M	VL[2]	H+	>500%	7,800	150	1,800
Tilton	Stabilizing	VL	VL	VL	VL	VL	0%	5,400	<100	--
Toutle	Contributing	VL	H	L	VL	M	>500%	3,100	100	1,100
Kalama	Contributing[2]	VL	H	L	VL	L	>500%	4,900	100	300
Lewis NF [C]	Primary	VL	L	M	VL	H	>500%	15,700	300	1,500
Sandy (OR) [C,G]	Primary	--[3]	--[3]	--[3]	M	H	--[3]	--[3]	--[3]	--[3]
Gorge Fall										
L. Gorge (WA/OR)	Contributing	VL	M	L	VL[2]	M	>500%	n/a	<50	1,200
U. Gorge (WA/OR) [C]	Contributing[1]	VL	M	L	VL[2]	M	>500%	n/a	<50	1,200
White Salmon [C]	Contributing	VL	L	L	VL	M	>500%	n/a	<50	500
Hood (OR)	Primary[4]	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]
Gorge Spring										
White Salmon [C]	Contributing	VL	VL	VL	VL	L+	>500%	n/a	<50	500
Hood (OR)	Primary	--[3]	--[3]	--[3]	VL	VH	--[3]	--[3]	--[3]	--[3]

Source: LCRFB 2010.
L = Low; M = Moderate; H = High; VH/E = Very High/Extinct.
[1] Increase relative to interim Plan.
[2] Reduction relative to interim Plan.
[3] Addressed in Oregon Management Unit plan.
[C] Designated as a historical core population by the TRT.
[G] Designated as a historical legacy population by the TRT.

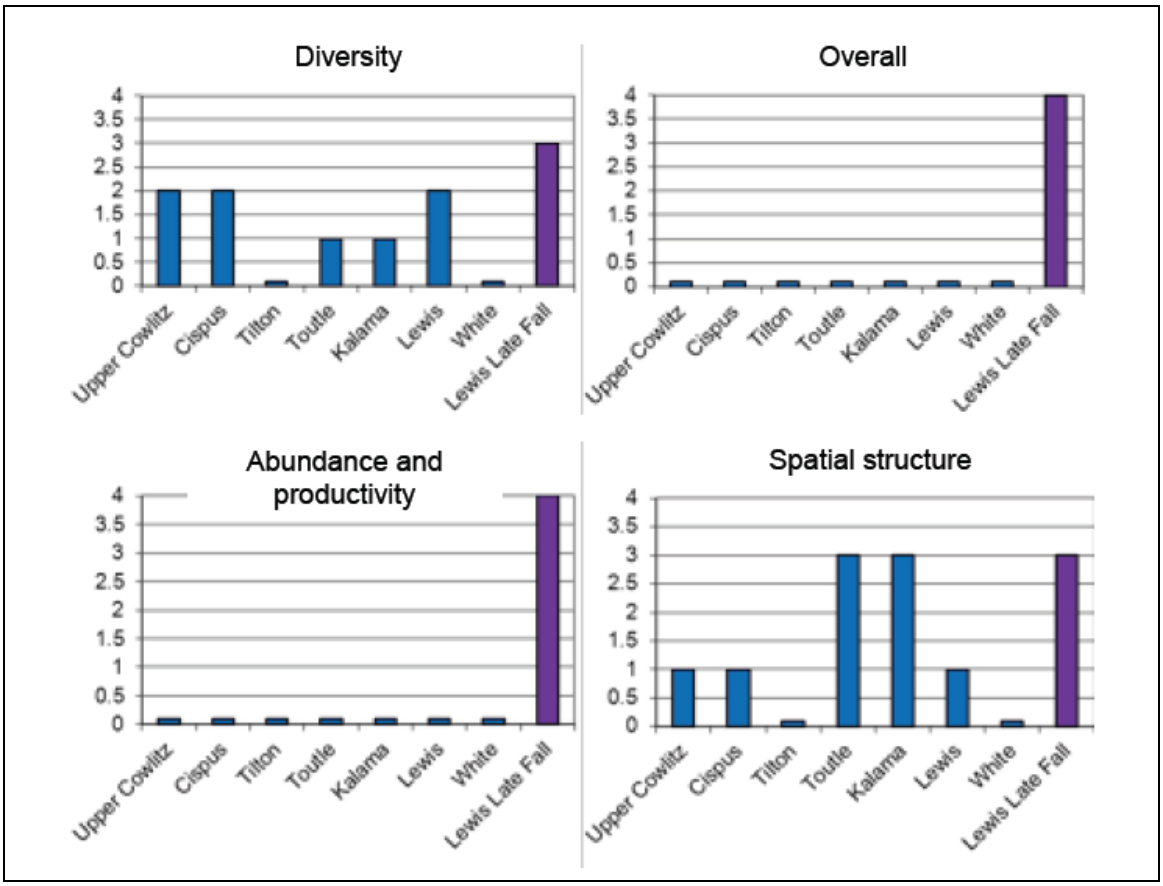

Figure 2.2.2.1. Current status of Washington lower Columbia River spring Chinook and late fall-run (bright) Chinook salmon populations for the VSP parameters and overall population risk. (LCFRB Recovery Plan 2010, chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") and 4 is very low risk (Ford 2011).

Lower Columbia River Steelhead *(Oncorhynchus mykiss*): The DPS includes all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in streams and tributaries to the Columbia River between the Cowlitz and Wind Rivers, Washington (inclusive), and the Willamette and Hood Rivers, Oregon (inclusive), as well as ten artificial propagation programs: the Cowlitz Trout Hatchery (in the Cispus, Upper Cowlitz, Lower Cowlitz, and Tilton Rivers), Kalama River Wild (winter- and summer-run) and Lewis River Wild Winter.

Status: Of the 26 historical populations in the ESU, 17 are considered at high or very high risk. Populations in the upper Lewis and Cowlitz watersheds remain cut-off from access to essential spawning habitat by hydroelectric dams. Projects to allow access have been initiated in the Cowlitz and Lewis systems but these have not yet produced self-sustaining populations (Ford 2011). Condit Dam on the White Salmon River was breached October 26, 2011. WDFW is currently developing watershed-specific management plans in accordance with the SSMP. As part of this planning process, WDFW is proposing to complete a thorough review of current steelhead stock status using the most up to date estimates of adult abundance, juvenile production and genetic information.

Table 2.2.2.2. Baseline viability status, viability and abundance objectives, and productivity improvement targets for lower Columbia River steelhead populations.

		Baseline viability					Prod.	Abundance		
Population	Contribution	A&P	S	D	Net	Obj.	target	Historical	Baseline	Target
Coast Winter										
Grays/Chinook	Primary	VH	VH	M	M[1]	H	0%[4]	1,600	800	800
Eloch/Skam	Contributing	VH	VH	M	M[1]	M+	0%[4]	1,100	600	600
Mill/Ab/Germ	Primary	H	VH	M	M[1]	H	0%[4]	900	500	500
Youngs Bay (OR)	Primary	--[3]	--[3]	--[3]	VH	VH	--[3]	--[3]	--[3]	--[3]
Big Creek (OR)	Primary	--[3]	--[3]	--[3]	H	VH	--[3]	--[3]	--[3]	--[3]
Clatskanie (OR)	Primary	--[3]	--[3]	--[3]	VH	VH	--[3]	--[3]	--[3]	--[3]
Scappoose (OR)	Primary	--[3]	--[3]	--[3]	VH	VH	--[3]	--[3]	--[3]	--[3]
Cascade Winter										
Lower Cowlitz	Contributing	L	M	M	L	M	+5%	1,400	350	400
Upper Cowlitz [C,G]	Primary	VL	M	M	VL[2]	H[1]	>500%	1,400	<50	500
Cispus [C,G]	Primary	VL	M	M	VL[2]	H[1]	>500%	1,500	<50	500
Tilton	Contributing	VL	M	M	VL	L	>500%	1,700	<50	200
S.F. Toutle	Primary	M	VH	H	M	H+	+35%	3,600	350	600
N.F. Toutle [C]	Primary	VL	H	H	VL[2]	H	+125%		120	600
Coweeman	Primary	L	VH	VH	L[2]	H	+25%	900	350	500
Kalama	Primary	L	VH	H	L[2]	H+	+45%	800	300	600
N.F. Lewis [C]	Contributing	VL	M	M	VL[2]	M	>500%	8,300	150	400
E.F. Lewis	Primary	M	VH	M	M[1]	H	+25%	900	350	500
Salmon	Stabilizing	VL	H	M	VL[2]	VL	0%	na	<50	--
Washougal	Contributing	L	VH	M	L[2]	M	+15%	800	300	350
Clackamas (OR) [C]	Primary	--[3]	--[3]	--[3]	M	H	--[3]	--[3]	--[3]	--[3]
Sandy (OR) [C]	Primary	--[3]	--[3]	--[3]	L	VH	--[3]	--[3]	--[3]	--[3]
Cascade Summer										
Kalama [C]	Primary	H	VH	M	M[1]	H	0%[4]	1,000	500	500
N.F. Lewis	Stabilizing	VL	VL	VL	VL	VL	0%	na	150	--
E.F. Lewis [G]	Primary	VL	VH	M	VL[2]	H	>500%	600	<50	500
Washougal [C,G]	Primary	M	VH	M	M[1]	H	+40%	2,200	400	500
Gorge Winter										
L. Gorge (WA/OR)	Primary	L	VH	M	L[2]	H	+45%	na	200	300
U. Gorge (WA/OR)	Stabilizing	L	M	M	L[2]	L	0%	na	200	--
Hood (OR) [C,G]	Primary	--[3]	--[3]	--[3]	M	H	--[3]	--[3]	--[3]	--[3]
Gorge Summer										
Wind [C]	Primary	VH	VH	H	H[1]	VH	0%[4]	na	1,000	1,000
Hood (OR)	Primary	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]

Source: LCRFB 2010.
L = Low; M = Moderate; H = High; VH/E = Very High/Extinct.
[1] Increase relative to interim Plan.
[2] Reduction relative to interim Plan.
[3] Addressed in Oregon Management Unit plan.
[4] Improvement increments are based on abundance and productivity; however, this population will require improvement in spatial structure or diversity to meet recovery objectives.
[C] Designated as a historical core population by the TRT.
[G] Designated as a historical legacy population by the TRT.

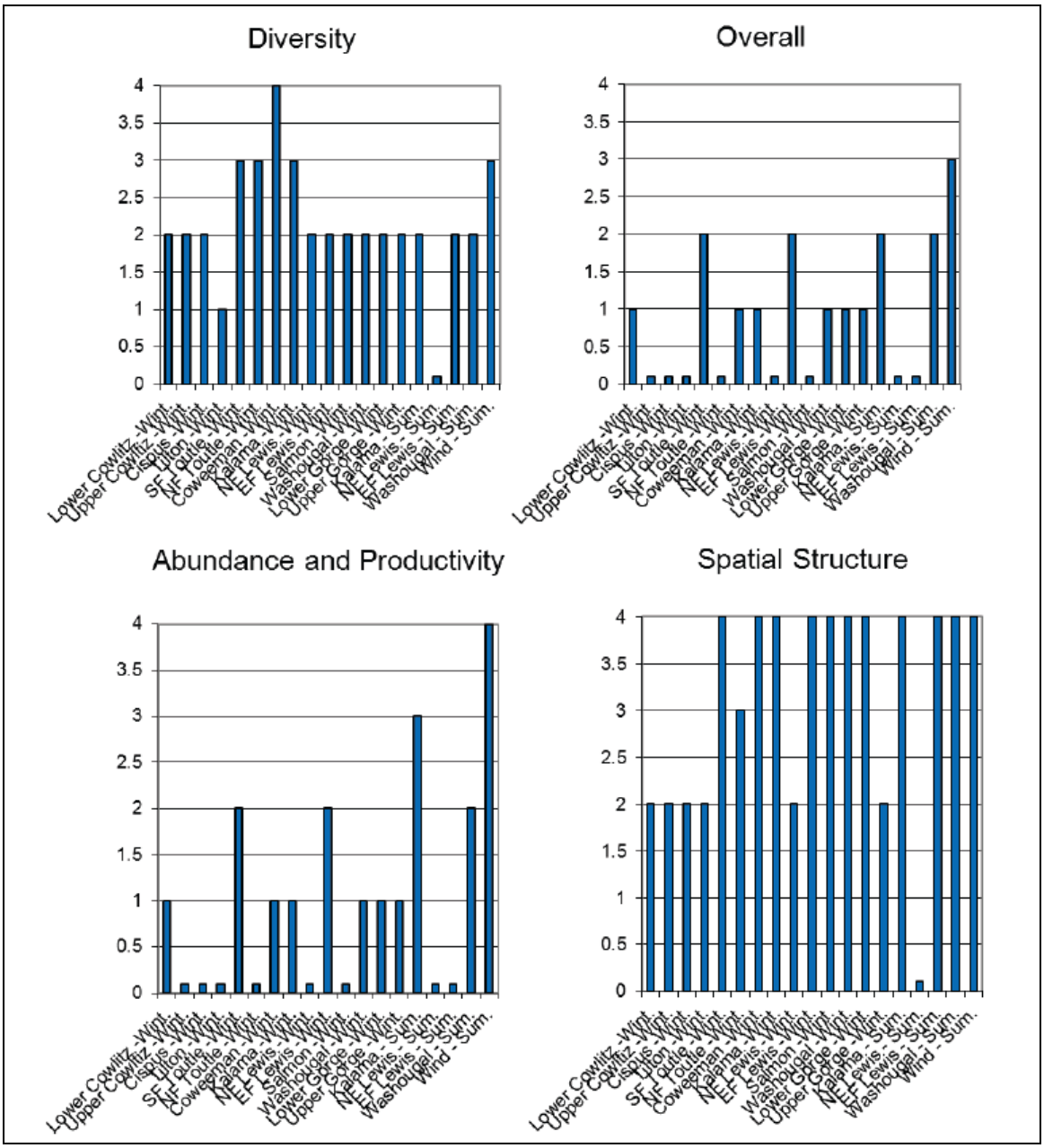

Figure 2.2.2.2. Current status of Washington LCR steelhead populations for the VSP parameters and overall population risk. (LCFRB 2010 Recovery Plan, chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") and 4 is very low risk (Ford 2011).

Lower Columbia River coho *(Oncorhynchus kisutch)*: Originally part of a larger Lower Columbia River/Southwest Washington ESU, Lower Columbia coho were identified as a separate ESU and listed as threatened on June 28, 2005. The ESU includes all naturally spawned populations of coho salmon in the Columbia River and its tributaries in Washington and Oregon, from the mouth of the Columbia up to and including the Big White Salmon and Hood Rivers, The twenty-five artificial propagation programs include: the Grays River, Sea Resources Hatchery, Peterson Coho Project, Big Creek Hatchery, Cathlamet High School FFA Type-N Coho Program, Cowlitz Type-N Coho Program in the Upper and Lower Cowlitz Rivers, Cowlitz Game and Anglers Coho Program, Friends of the Cowlitz Coho Program, North Fork Toutle River Hatchery, Kalama River Type-N Coho Program, Kalama River Type-S Coho Program,

Washougal Hatchery Type-N Coho Program, Lewis River Type-N Coho Program, Lewis River Type-S Coho Program, Fish First Wild Coho Program, Fish First Type-N Coho Program.

Status: Three status evaluations of LCR coho status, all based on WLC-TRT criteria, have been conducted since the last BRT status update in 2005 (McElhany et al. 2007, Beamesderfer et al. 2010, LCFRB 2010). All three evaluations concluded that the ESU is currently at very high risk of extinction. All of the Washington side populations are considered at very high risk, although uncertainty is high because of a lack of adult spawner surveys. The 2005 BRT evaluation noted that smolt traps indicate some natural production in Washington populations, though given the high fraction of hatchery origin spawners suspected to occur in these populations it is not clear that any are self-sustaining (Ford 2011). Since this time WDFW has implemented an ESU wide monitoring program for LCR coho which began in 2010. Preliminary results indicate that natural-origin population abundance may be higher than previously thought for certain populations (WDFW, unpublished). Results from the first three years of monitoring should be available in the near future.

Table 2.2.2.3. Baseline viability status, viability and abundance objectives, and productivity improvement targets for lower Columbia River coho populations.

		Baseline viability					Prod.	Abundance		
Population	Contribution	A&P	S	D	Net	Obj.	target	Historical	Baseline	Target
Coast										
Grays/Chinook [L]	Primary	VL	H	VL	VL[2]	H	+370%	3,800	<50	2,400
Eloch/Skam [L]	Primary	VL	H	VL	VL[2]	H	+170%	6,500	<50	2,400
Mill/Ab/Germ [L]	Contributing	VL	H	L	VL[2]	M	>500%	2,800	<50	1,800
Youngs (OR) [L]	Stabilizing	--[3]	--[3]	--[3]	VL	VL	--[3]	--[3]	--[3]	--[3]
Big Creek (OR) [L]	Stabilizing[2]	--[3]	--[3]	--[3]	VL	VL	--[3]	--[3]	--[3]	--[3]
Clatskanie (OR) [L]	Primary[1]	--[3]	--[3]	--[3]	L	VH	--[3]	--[3]	--[3]	--[3]
Scappoose (OR) [L]	Primary	--[3]	--[3]	--[3]	M	VH	--[3]	--[3]	--[3]	--[3]
Cascade										
Lower Cowlitz [L]	Primary	VL	M	M	VL[2]	H	+100%	18,000	500	3,700
Upper Cowlitz [E, L]	Primary[1]	VL	M	L	VL	H[1]	>500%	18,000	<50	2,000
Cispus [E, L]	Primary[1]	VL	M	L	VL	H[1]	>500%	8,000	<50	2,000
Tilton [E, L]	Stabilizing[2]	VL	M	L	VL	VL[2]	0%	5,600	<50	--
Toutle SF [E, L]	Primary	VL	H	M	VL[2]	H	+180%	27,000	<50	1,900
Toutle NF [E, L]	Primary	VL	M	L	VL[2]	H	+180%		<50	1,900
Coweeman [L]	Primary	VL	H	M	VL[2]	H	+170%	5,000	<50	1,200
Kalama [L]	Contributing	VL	H	L	VL[2]	L	>500%	800	<50	500
NF Lewis [E, L]	Contributing	VL	L	L	VL[2]	L	+50%	40,000	200	500
EF Lewis [E, L]	Primary	VL	H	M	VL[2]	H	>500%	3,000	<50	2,000
Salmon [L]	Stabilizing	VL	M	VL	VL	VL	0%	na	<50	--
Washougal [L]	Contributing	VL	H	L	VL[2]	M+	>500%	3,000	<50	1,500
Clackamas (OR) [E, L]	Primary	--[3]	--[3]	--[3]	M	VH	--[3]	--[3]	--[3]	--[3]
Sandy (OR) [E, L]	Primary	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]
Gorge										
L Gorge (WA/OR) [L]	Primary	VL	M	VL	VL[2]	H	+400%	na	<50	1,900
U Gorge (WA) [L]	Primary[1]	VL	M	VL	VL[2]	H	+400%	na	<50	1,900
U Gorge/Hood (OR)[E]	Contributing[4]	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]

Source: LCRFB 2010.
L = Low; M = Moderate; H = High; VH/E = Very High/Extinct.
[1] Increase relative to interim Plan.
[2] Reduction relative to interim Plan.
[3] Addressed in Oregon Management Unit plan.
[4] Improvement increments are based on abundance and productivity; however, this population will require improvement in spatial structure or diversity to meet recovery objectives.
[E] Early run (Type S) coho stock.
[L] Late run (Type N) coho stock.
(Core and Legacy populations not designated by the TRT for coho).

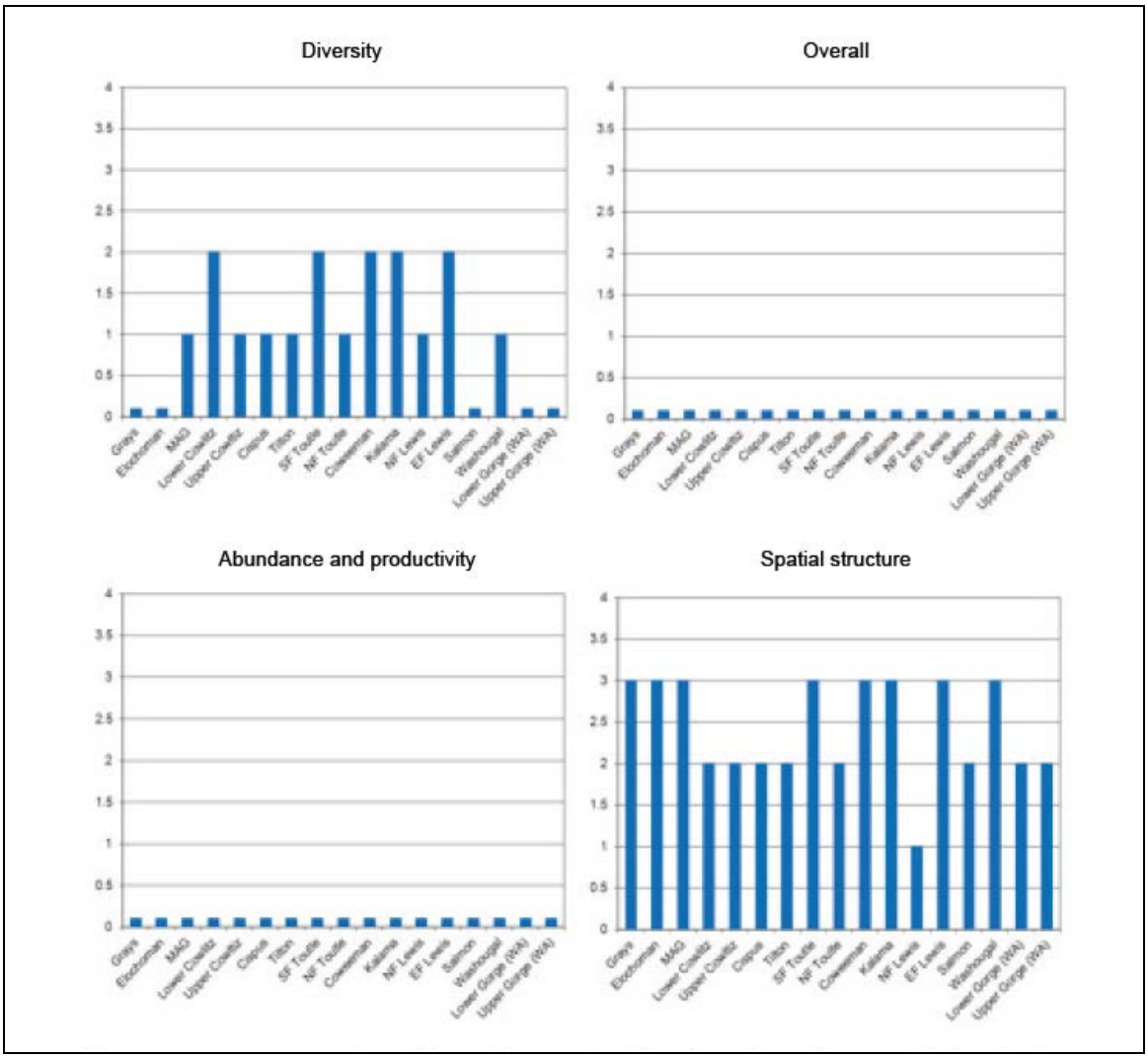

Figure 2.2.2.3. Current status of Washington LCR coho populations for the VSP parameters and overall population risk. (LCFRB 2010 recovery plan, chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") and 4 is very low risk (Ford 2011).

Columbia River chum salmon (*Oncorhynchus keta*). ESU includes all naturally spawned populations of chum salmon in the Columbia River and its tributaries in Washington and Oregon, as well as artificial propagation programs at Big Creek, Grays River, Lewis River, and Washougal River/Duncan Creek chum hatchery programs.

Status: A report on the population structure of lower Columbia River salmon and steelhead populations was published by the WLC-TRT in 2006 (Myers et al. 2006). The chum population designations in that report are used in this status update and were used for status evaluations in recent recovery plans by ODFW and LCFRB.

The LCFRB completed a revision recovery plan in 2010 that includes Washington populations of Columbia River chum salmon. This plan includes an assessment of the current status of Columbia River chum populations, which relied and built on the viability criteria developed by the WLC-TRT (McElhany et al. 2006) and an earlier evaluation of Oregon WLC populations (McElhany et al. 2007). This evaluation assessed the status of populations with regard to the VSP parameters of A/P, spatial structure, and diversity (McElhany et al. 2000). The result of this analysis is shown in Figure 2.2.2.4. The analysis indicates that all of the Washington populations with two exceptions

are in the overall very high risk category (also described as extirpated or nearly so). The Grays River population was considered to be at moderate risk and the Lower Gorge population to be at low risk. The very high risk status assigned to the majority of Washington populations (and all the Oregon populations) reflects the very low abundance observed in these populations (e.g., <10 fish/year) (Ford 2011).

Table 2.2.2.4. Baseline viability status, viability and abundance objectives, and productivity improvement targets for lower Columbia River chum populations.

		Baseline viability					Prod.	Abundance		
Population	Contribution	A&P	S	D	Net	Obj.	target	Historical	Baseline	Target
Coast										
Grays/Chinook [C,G]	Primary	VH	M	H	M[1]	VH	0%[4]	10,000	1,600	1,600
Eloch/Skam [C]	Primary	VL	H	L	VL[2]	H	>500%	16,000	<200	1,300
Mill/Ab/Germ	Primary	VL	H	L	VL	H	>500%	7,000	<100	1,300
Youngs (OR) [C]	Stabilizing[2]	--[3]	--[3]	--[3]	VL	VL	--[3]	--[3]	--[3]	--[3]
Big Creek (OR) [C]	Stabilizing[2]	--[3]	--[3]	--[3]	VL	VL	--[3]	--[3]	--[3]	--[3]
Clatskanie (OR)	Primary[1]	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]
Scappoose (OR)	Primary[1]	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]
Cascade										
Cowlitz (Fall) [C]	Contributing	VL	H	L	VL	M	>500%	195,000	<300	900
Cowlitz (Summer) [C]	Contributing	VL	L	L	VL	M	>500%	n/a	n/a	900
Kalama	Contributing	VL	H	L	VL	M	>500%	20,000	<100	900
Lewis [C]	Primary	VL	H	L	VL	H	>500%	125,000	<100	1,300
Salmon	Stabilizing	VL	L	L	VL	VL	0%	n/a	<100	--
Washougal	Primary	VL	H	L	VL[2]	H+	>500%	18,000	<100	1,300
Clackamas (OR) [C]	Contributing	--[3]	--[3]	--[3]	VL	M	--[3]	--[3]	--[3]	--[3]
Sandy (OR)	Primary	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]
Gorge										
L. Gorge (WA/OR) [C,G]	Primary	VH	H	VH	H[1]	VH	0%[4]	6,000	2,000	2,000
U. Gorge (WA/OR)	Contributing	VL	L	L	VL	M	>500%	11,000	<50	900

Source: LCRFB 2010.
L = Low; M = Moderate; H = High; VH/E = Very High/Extinct.
[5] Increase relative to interim Plan.
[6] Reduction relative to interim Plan.
[7] Addressed in Oregon Management Unit plan.
[8] Improvement increments are based on abundance and productivity; however, this population will require improvement in spatial structure or diversity to meet recovery objectives.
[C] Designated as a historical core population by the TRT.
[G] Designated as a historical legacy population by the TRT.

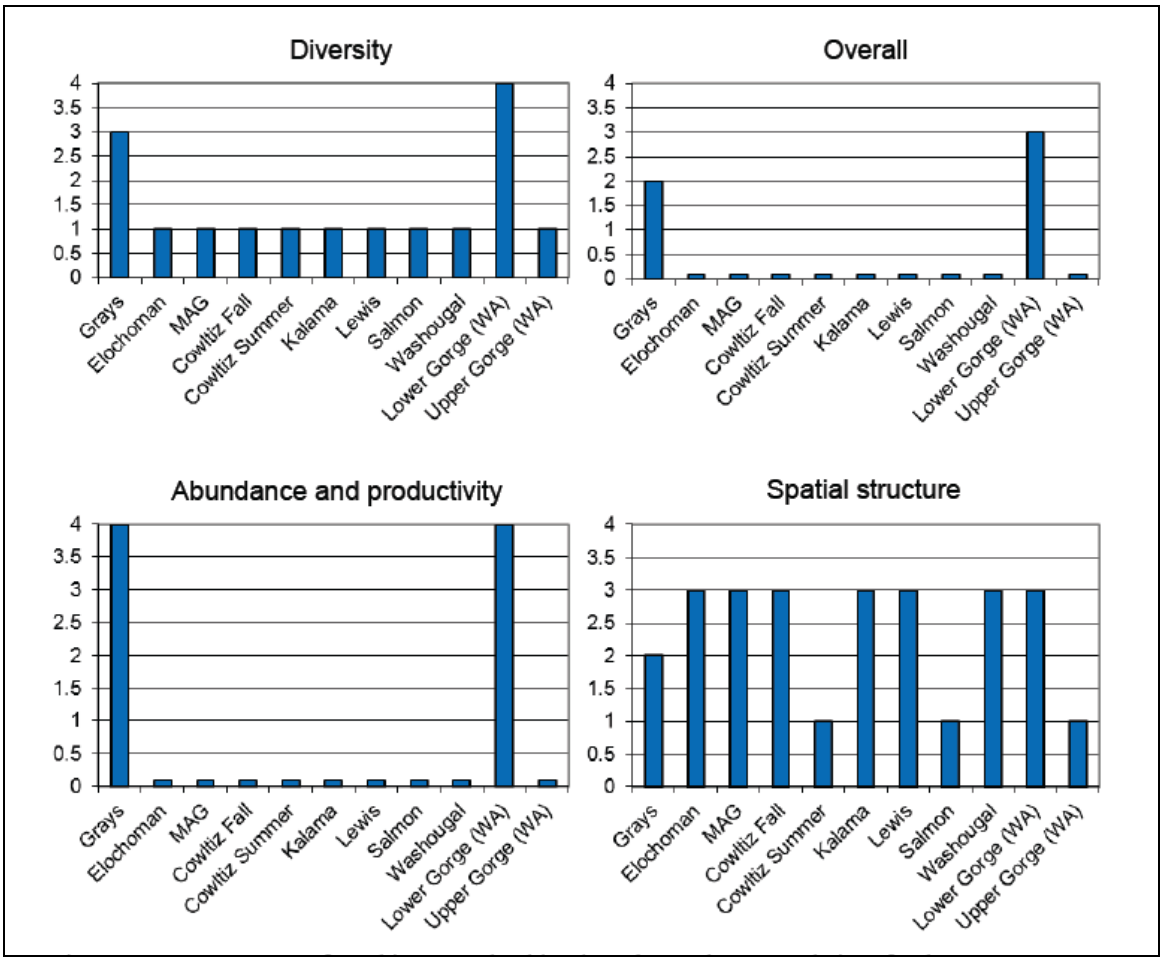

Figure 2.2.2.4. Current status of Washington CR chum populations for the VSP parameters and overall population risk. (LCFRB 2010 Recovery Plan, Chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") and 4 is very low risk (Ford 2011).

Elochoman River eulachon (*Thaleichthys pacificus*): The Southern Distinct Population Segment (DPS) of Pacific eulachon was listed as *Threatened* under the ESA on May 17, 2010 (75 FR 13012).

Status: The lower Columbia River and its tributaries support the largest known spawning run of eulachon. The main stem of the lower Columbia River provides spawning and incubation sites, and major tributaries in Washington State that have supported runs in the past include the Grays, Elochoman, Cowlitz, Kalama and Lewis Rivers. In the Elochoman River, there is no history of commercial or recreation harvest of eulachon. WDFW surveys have indicated successful spawning in the lower two miles of the river although surveys by the Cowlitz Indian Tribe documented larval eulachon as far upstream as RM 5.2. Spawning events have been confirmed in the river seven times in the last fifteen years (JCRMS 2010).The current abundance of eulachon is low and is declining in all surveyed populations throughout the DPS. The major threats and continued causes for declines in eulachon populations include climate change and its impacts on both ocean conditions and freshwater habitat, by-catch in commercial fisheries, dams and water diversions, degraded water quality, dredging and predation (NMFS 2011b).

- Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.

Not available for most species. See HGMP section 11.1 for planned M&E. Juvenile coho production estimates is the one measure of production in the Lower Columbia system.

Table 2.2.2.5. Lower Columbia River Washington tributary coho smolt production estimates, 1997-2009 (WDFW, Region 5).

Year	Cedar Creek	Mill Creek	Abernathy Creek	Germany Creek	Cowlitz Falls Dam	Mayfield Dam
1997	-----	-----	-----	-----	3,700	700
1998	38,400	-----	-----	-----	110,000	16,700
1999	28,000	-----	-----	-----	15,100	9,700
2000	20,300	-----	-----	-----	106,900	23,500
2001	24,200	6,300	6,500	8,200	334,700	82,200
2002	35,000	8,200	5,400	4,300	166,800	11,900
2003	36,700	10,500	9,600	6,200	403,600	38,900
2004	37,000	5,700	6,400	5,100	396,200	36,100
2005	58,300	11,400	9,000	4,900	766,100	40,900
2006	46,000	6,700	4,400	2,300	370,000	33,600
2007	29,300	7,000	3,300	2,300	277,400	34,200
2008	36,340	90,97	5,077	3,976	-----	38,917
2009	61,140	62,83	3,761	2,576	-----	29,718
2010	-----	-----	-----	-----	-----	49,171
2011	-----	-----	-----	-----	-----	43,831

Source: LCR FMEP Annual Report 2010 and WDFW Data 2012.

- Provide the most recent 12 year annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

Table 2.2.2.6. Spring Chinook salmon total spawner abundance estimates in LCR tributaries, 2000-2012.

Year	Cowlitz	Kalama	Lewis
2000	266	34	523
2001	347	578	754
2002	419	898	498
2003	1,953	790	745
2004	1,877	358	529
2005	405	380	122
2006	783	292	857
2007	74	2,150	264
2008	425	364	40
2009	763	34	80
2010	711	0	160
2011	1,359	26	120
2012	1,359	28	200

Source: Joe Hymer, WDFW Annual Database 2012

Table 2.2.2.7. Fall Chinook salmon total spawner abundance estimates in LCR tributaries, 2000-2011[a].

Year	Elochoman River	Coweeman River[a]	Grays River	Skamokawa Creek	Cowlitz River	Green River (Toutle)	SF Toutle River	Kalama River	EF Lewis River	NF Lewis River	Washougal River
2000	884	424	80	482	2,100	1,580	204	3,877	391	6,504	2,757
2001	230	251	104	3	1,979	1,081	102	3,451	245	4,281	1,704
2002	332	566	390	7	3,038	5,654	216	10,560	441	5,518	2,728
2003	2,204	753	149	529	2,968	2,985	327	9,272	607	11,519	2,678
2004	4,796	1,590	745	2,109	4,621	4,188	618	6,680	918	13,987	10,597
2005	6,820	1,090	387	588	10,329	13,846	140	24,782	727	18,913	3,444
2006	7,581	900	82	372	14,427	7,477	450	18,952	1,375	17,106	6,050
2007	194	140	99	36	2,724	961	30	1,521	308	10,934	2,143
2008	782	95	311	253	1,334	824	45	2,617	236	4,268	3,182
2009	231	147	93	139	2,156	1,302	66	4,356	110	6,112	2,995
2010	1,883	1,330	12	268	2,762	605	NE	3,576	314	8,908	4,529
2011	508	2,148	353	41	1,616	668	NE	10,639	334	14,033	2,961

Source: Ron Roler, WDFW Natural Spawn Progress Reports 2012.
* Estimates of total adult and jack fall Chinook. May include fish put upstream of hatchery weirs.

Table 2.2.2.8. Wild winter steelhead escapement estimates for select SW Washington DPS populations, current WDFW escapement goals and LCSRP abundance targets.

Location	Grays River	Elochoman/ Skamokawa	Mill/Abernathy/ Germany
WDFW Escapement Goal	**1486**	**853**	**508**
LCSRP Abundance Target	**800**	**600**	**500**
2000	1064	650	380
2001	1130	656	458
2002	724	370	354
2003	1200	668	342
2004	1132	768	446
2005	396	376	274
2006	718	632	398
2007	724	490	376
2008	764	666	528
2009	568	222	396
2010	422	534	398
2011	318	442	270
3-year average	**436**	**399**	**355**
5-year average	**559**	**471**	**394**
10-year average	**697**	**517**	**378**

Source: WDFW Data 2012

Table 2.2.2.9: Wild winter steelhead escapement estimates for select SW Washington DPS populations, current WDFW escapement goals and LCSRP abundance targets.

Location	Coweeman	SF Toutle	NF Toutle/ Green	Kalama	EF Lewis	Washougal
WDFW Escapement Goal	**1064**	**1058**	**NA**	**1000**	**1243**	**520**
LCSRP Abundance Target	**500**	**600**	**600**	**600**	**500**	**350**
2000	530	490	----	921	NA	NA
2001	384	348	----	1042	377	216
2002	298	640	----	1495	292	286
2003	460	1510	----	1815	532	764
2004	722	1212	----	2400	1298	1114
2005	370	520	388	1856	246	320
2006	372	656	892	1724	458	524
2007	384	548	565	1050	448	632
2008	722	412	650	776	548	732
2009	602	498	699	1044	688	418
2010	528	274	508	961	336	232
2011	408	210	416	622	308	204
3-year average	**513**	**327**	**541**	**876**	**444**	**285**
5-year average	**529**	**388**	**568**	**891**	**466**	**444**
10-year average	**487**	**648**	***588**	**1374**	**515**	**523**

Source: WDFW Data 2012.
* 7-year average for NF Toutle/Green.

Table 2.2.2.10: Wild summer steelhead population estimates for LCR populations from 2001 to 2011, current WDFW escapement goals, and LCSRP abundance targets.

Location	Kalama	EF Lewis	Washougal	Wind
WDFW Escapement Goal	**1000**	**NA**	**NA**	**1557**
LCSRP Abundance Target	**500**	**500**	**500**	**1000**
2001	286	271	184	457
2002	454	440	404	680
2003	817	910	607	1096
2004	632	425	NA	861
2005	400	673	608	587
2006	387	560	636	632
2007	361	412	681	737
2008	237	365	755	614
2009	308	800	433	580
2010	370	602	787	788
2011	534	1084*	956*	1468
3-year average	**404**	**829**	**725**	**945**
5-year average	**362**	**653**	**722**	**837**
10-year average	**450**	**627**	**652**	**804**

Source: WDFW Data 2012.
* Preliminary estimates.

Table 2.2.2.11. Population estimates of chum salmon in the Columbia River.

Location	2002	2003	2004	2005	2006	2007	2008	2009	2010[a]	2011[a]
Crazy Johnson Creek	---	---	966	1,471	3,639	759	1,034	981	677	2,374
WF Grays River	---	---	9,015	1,324	1,232	1,909	800	994	1,967	7,002
Mainstem Grays River	---	---	4,872	1,400	1,244	1,164	886	750	3,467	1,848
I-205 area	3,468	2,844	2,102	1,009	862	544	626	1,132	2,105	4,947
Multnomah area	1,267	1,130	665	211	313	115	28	102	427	641
St Cloud area	---	137	104	92	173	9	1	14	99	509
Horsetail area	---	---	106	40	63	17	33	6	45	183
Ives area[b]	4,466	1,942	363	263	387	145	168	141	214	162
Duncan Creek[c]	13	16	2	7	42	9	2	26	48	85
Hardy Creek	343	392	49	73	104	14	3	39	137	173
Hamilton Creek	1,000	500	222	174	246	79	114	115	247	517
Hamilton Spring Channel	794	363	346	84	236	44	109	91	187	324
Grays return[d]	12,041	16,974	15,157	4,327	6,232	3,966	2,807	2,833	6,399	11,518
I-205 to Bonneville return	11,351	7,324	3,959	1,953	2,426	976	1,084	1,666	3,509	7,541
Lower Columbia River Total	23,392	24,298	19,116	6,280	8,658	4,942	3,891	4,499	9,908	19,059

Source: Todd Hillson - WDFW Chum Program 2012.

[a] Data for 2010 and 2011 is preliminary.

[b] Ives area counts are the carcass tagging estimate plus fish removed for broodstock, except for 2007 and 2008, which is area under the curve.

[c] Totals for Duncan Creek do not include broodstock brought in from mainstem spawning areas, adult trap catch or surveys below monitoring weirs only..

[d] Grays return totals include natural spawners and removed for broodstock.

- Provide the most recent 12 year estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

Not available for most species. In other HGMPs provided to NOAA (Puget Sound, Upper Columbia), indirect takes from hatchery releases such as predation and competition is highly uncertain and dependent on a multitude of factors (i.e. data for population parameters - abundance, productivity and intra species competition) and although HGMPs discuss our current understanding of these effects, it is not feasible to determine indirect take (genetic introgression, density effects, disease, competition, predation) due to these activities. See HGMP section 11.1 for planned M&E. The proportion of effective hatchery-origin spawners (pHOS) should be less than 10% of the naturally spawning population.

2.2.3) <u>Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of NMFS listed fish in the target area, and provide estimated annual levels of take.</u>

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

Broodstock Program:

Broodstock Collection: There is no adult collection, egg taking or incubation activities associated with this program (see also Cowlitz Salmon Hatchery and Lewis Spring Chinook HGMP

Rearing Program:

Operation of Hatchery Facilities: If eulachon ascend the river beyond their current known range, the water intake dam at the Beaver Creek Hatchery may be a barrier to any further upstream

migration of eulachon (Wade 2002). Modifications to the Beaver Creek Hatchery intake structure were completed in 2012 to address fish passage issues.

Net pen rearing is conducted under the criteria and policies of the Integrated Hatchery Operations team (IHOT). Full time rearing at the net pens does not occur and avoids summer and early fall temperatures (60-70°F) that are detrimental to the project and surrounding environment. Appropriate net pen mesh size confines the program until fish are in smolt condition and ready for release. Siting and placement of the net pen complexes are permitted and rearing activities meet State water quality (NPDES Clean Water Act) guidelines and satisfy all permit requirements. Indirect take from this operation is unknown.

Disease: Over the years, rearing densities, disease prevention and fish health monitoring have greatly improved the health of the programs at Lower Columbia River Hatcheries. Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995) Chapter 5 have been instrumental in reducing disease outbreaks. Listed stocks are geographically removed from the net pen sites. Prior to release, the Chinook population health and condition is established by the Area Fish Health Specialist. This is commonly done 1-3 weeks pre-release. Indirect take from disease is unknown.

Release:

Hatchery Production/Density-Dependent Effects: Hatcheries can release numbers of fish that can exceed the density of the natural productivity in a limited area for a short period of time and can compete with listed fish. Fish are released as active smolts that will emigrate in order to minimize the effect of the release. Indirect take from density dependent effects is unknown.

*Potential Cathlamet Channel Chinook predation and competition effects on listed salmonids and eulachon***:** The proposed annual production goal for this program is 250,000 fish.

Program fish released during this timeframe could encounter listed fish (emerging Chinook, chum and proposed coho) in the mainstem Columbia during out-migration. Chinook are released at 10 fpp. Due to size differences between Chinook smolts and fingerling listed stocks, competition is unlikely with different prey items and habitat preferences. In addition, the net pens are located within the mainstem Columbia and not within the any stream or river. Indirect take from predation is unknown.

Both juvenile and adult salmonids have been documented to feed on eulachon (Gustafson et al. 2010). Predation of eulachon by spring Chinook reared in this program may occur, however it is unknown to what degree such predation may occur.

Residualism: To maximize smolting characteristics and minimize residualism, WDFW adheres to a combination of acclimation, volitional release strategies, size, and time guidelines.

- Condition factors, standard deviation and co-efficient of variation (CV) are measured throughout the rearing cycle and at release.
- Feeding rates and regimes throughout the rearing cycle are programmed to satiation feeding to minimize out-of-size fish and programmed to produce smolt size fish at date of release.
- Based on past history, fish have reached a size and condition that indicates a smolted condition at release.
- Releases occur within known time periods of species emigration from acclimated ponds.
- Releases from these ponds are volitional with large proportions of the populations moving out initially with the remainder of the population vacating within days or a few weeks.

Potential straying effects: The net pens will be located in Cathlamet Channel, near the town of Cathlamet, on the Columbia River near the confluence with Birnie Creek (WRIA 25.0281). Birnie Creek should provide enough attraction water, on which returning adults from this program can home, to reduce possible straying to other nearby watersheds. Birnie Creek is not

known to support Chinook salmon and, as such, any impacts from program strays into Birnie Creek should be minimal (Wade 2002).

In addition, WDFW operates a weir on the Elochoman River for fall Chinook and plans to operate the weir during the spring Chinook return to monitor possible straying effects from this program (see HGMP section 7.9).

- Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.

Unknown.

- Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

No take tables will be provided for this program.

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

For listed species, any abnormal take observed, staff would inform WDFW District Biologist, Fish Health Specialist, or Area Habitat Biologist, who along with the Complex Manager would determine an appropriate plan and consult with NOAA for adaptive management review and protocol.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

This is a segregated/harvest program, and is not used to supplement natural-origin fish. WDFW's primary objective is to augment harvest while trying to minimize the abundance of hatchery-origin fish on the natural spawning grounds. The LCFRB Recovery Plan (2010) identifies the presence of hatchery-origin fish on the natural spawning grounds as a factor in the reduced productivity of the natural populations in Lower Columbia River ESUs.

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the NPPC *Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

WDFW (draft) Conservation and Sustainable Fisheries Plan (C&SFP). This program is identified within the WDFW draft Conservation and Sustainable Fisheries Plan. This document addresses priorities of the *LCFRB Recovery Plan (2010)* and *Fishery Management and Evaluation Plan (FMEP)*, the legal requirements of the Endangered Species Act (ESA), and recommendations of the Hatchery Scientific Review Group (HSRG). It describes the adaptation of general principles for hatchery management to the unique genetic and ecological setting of each watershed.

Mitchell Act. This program will use Mitchell Act Funding for the initial startup while other funding sources are secured. Initially passed in 1938, the Mitchell Act is intended to help rebuild and conserve the fish runs, and mitigate the impacts to fish from water diversions, dams on the mainstem of the Columbia River, pollution and logging. The Mitchell Act specifically directs establishment of salmon hatcheries, conduct of engineering and biological surveys and experiments, and installing fish protective devices. It also authorizes agreements with State fishery agencies and construction of facilities on State-owned lands. NMFS has administered the

program as of 1970. There are 15 Mitchell Act facilities in Washington State; the majority of which are below Bonneville Dam.

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

Hatchery salmon and steelhead production levels are detailed in the annual Future Brood Document. The Future Brood Document (FBD) is a pre-season planning document for fish hatchery production in Washington State for the upcoming brood stock collection and fish rearing season (July 1 – June 30).

See also HGMP section 3.1.

3.3) Relationship to harvest objectives.

Total annual harvest is dependent on management response to annual abundance in PSC (U.S/Canada), PFMC (U.S. ocean), and Columbia River Compact forums. WDFW also has received authorization for tributary, Columbia River mainstem, and ocean fisheries; the combined harvest rates in the Fisheries Management and Evaluation Plan (FMEP), Columbia River Fish Management Plan (CRFMP), and ocean fisheries are reviewed annually in the North of Falcon process to ensure the harvest rates are consistent with recovery of the Lower Columbia River Tule Chinook population.

The purpose of the Cathlamet Channel program is to provide fish for isolated harvest opportunity within the mainstem Columbia River near the town of Cathlamet. However, these hatchery programs benefit other fisheries as well. All Cathlamet Channel spring Chinook are adipose fin-clipped; 50,000 (20%) are released also containing a coded-wire tag (CWT).

3.3.1) Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

This is a new program, initiated in 2012, with first release in 2014. No harvest data is currently available for Cathlamet Channel spring Chinook (RMIS 2013).

3.4) Relationship to habitat protection and recovery strategies.

None available for this system.

3.5) Ecological interactions. [Please review Addendum A before completing this section. If it is necessary to complete Addendum A, then limit this section to NMFS jurisdictional species. Otherwise complete this section as is.]

(1) *Salmonid and non-salmonid fishes or species that could negatively impact the program:* Out-migrant hatchery fish can be preyed upon through the entire migration corridor from the river sub-basin to the mainstem Columbia River and estuary. Northern pikeminnows and introduced spiny rays, as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons in the Columbia mainstem sloughs, can prey on steelhead smolts. Mammals that can take a heavy toll on migrating smolts and returning adults include: harbor seals, sea lions, river otters and orcas

(2) *Salmonid and non-salmonid fishes or species that could be negatively impacted by the program:* Co-occurring natural salmon and steelhead populations in local tributary areas and the Columbia River mainstem corridor areas could be negatively impacted by program fish. Of primary concern are the ESA-listed endangered and threatened salmonids: Snake River fall-run Chinook salmon ESU (threatened); Snake River spring/summer-run Chinook salmon ESU (threatened); Lower Columbia River Chinook salmon ESU (threatened); Upper Columbia River spring-run Chinook salmon ESU (endangered); Columbia River chum salmon ESU (threatened); Snake River sockeye salmon ESU (endangered); Upper Columbia

River steelhead ESU (endangered); Snake River Basin steelhead ESU (threatened); Lower Columbia River steelhead ESU (threatened); Middle Columbia River steelhead ESU (threatened); and the Columbia River distinct population segment of bull trout (threatened). Listed fish can be impacted through a complex web of short and long term processes and over multiple time periods which makes evaluation of this a net effect difficult. Recent WDFW research (Sharpe et al 2008) has shown that the predation risk from hatchery steelhead smolt releases on smaller fish are minimal. See also HGMP section 2.2.3 "Predation and Competition."

(3) *Salmonid and non-salmonid fishes or other species that could positively impact the program.* Multiple hatchery programs including Chinook, coho and steelhead programs are released into the Lower Columbia River; limited natural production of Chinook, coho, chum and steelhead occurs in the system along with non-salmonid fishes (sculpins, lampreys and sucker etc.).

(4) *Salmonid and non-salmonid fishes or species that could be positively impacted by the program.* Nutrients provided by decaying carcasses might benefit fish and aquatic invertebrates in freshwater (Wipfli et al. 1998; Mathisen et al. 1988; Bilby et al. 1996). The program could also positively impact freshwater and marine species that prey on adult and juvenile fish. These species include:

- Northern pikeminnow
- Chinook salmon, steelhead, coastal cutthroat trout
- Pacific staghorn sculpin
- Eulachon
- Numerous marine pelagic fish species
- Avian predators, including: gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons
- Mammals including: harbor seals, sea lions, river otters and orcas.

SECTION 4. WATER SOURCE

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

Table 4.1.1. Water sources at Grays River Hatchery and Cathlamet Channel net pens.

Facility	Water Source	Water Right	Available Water Flow	ACOE or WDOE Water Use Permit(s)	Avg Water Temp. (F°)[a]	Usage	Limitations
Grays River Hatchery	Unnamed creek (surface)	S2-*18878 CWRIS	200-300 gpm	NPDES - WAG13 1015	*NA	Incubation to hatching and rearing	High water temps from mid-July – Sept; Low flows from mid-June – Sept; Summertime pathogens
	WF Grays River (surface)	S2-CCVOL 2P75	4500-5000 gpm		34 – 68	Broodstocking, rearing, acclimation	
	Well	G2-21976C WRIS	500-600 gpm		50 - 52	Incubation to eyeing and rearing	Low summertime flows July - Sept.

Cathlamet Channel NP	Columbia River (surface)	N/A	NA	No NPDES at this time.	34 - 62°F	Acclimation	Unknown

Grays River Hatchery. Water is from three sources: a well provides approximately 500-600 gpm for incubation and rearing; an unnamed creek through the hatchery grounds is seasonal (dry from early summer to late fall) and provides 200-300 gpm for incubation; a river intake provides 4,500 – 5,000 gpm for most of the flow needs.

The Cathlamet Channel net pens are located directly in the Columbia River (at around RKm 64); the river supplies all water.

See also Cowlitz and Lewis Spring Chinook HGMPs.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

Fish rearing activities at Grays River Hatchery meet State water quality guidelines and satisfy all permit requirements including Washington Department of Ecology *S2-08674 and NPDES permit WAG13 1015 (see **Table 4.1.1**).

Grays River Hatchery. The intake screens are in compliance with state and federal guidelines (NMFS 1995, 1996), but do not meet the current Anadromous Salmonid Passage Facility Design criteria (NMFS 2011a). Assessment and evaluation of the main intake has been completed. It has been determined by this evaluation that the upper watershed is unstable and we can expect bed load movement for the next 100 years. WDFW is currently evaluating options. The unnamed creek has an intake but WDFW has determined it to be a non-fish bearing seasonal stream. The stream effluent to the West Fork Grays River sits about 250-yds upstream of the hatchery effluents; the intake structure from which the facility draws water is approximately the same distance (250-yds) from the hatchery building itself and from the confluence with the W.F. Grays River (see also Grays River Hatchery HGMP).

Cathlamet Net Pens. WDOE has not yet developed a permit for freshwater net pens (the permit is currently under development). The site is in compliance, however, because the program meets guidelines under which require the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit is not required (production is <20,000 lbs total on site production and <5,000 lbs of fish feed per month).WDFW will reapply for their NPDES permits in December 2014 (personal comm. Catie Mains, WDFW Hatchery Data Unit).

Other risk aversion measures taken:

- Net pen sites are geographically isolated from listed fish habitat.
- Siting of the pens has sufficient depth and flow for siting guidelines.
- Net pen mesh sizes retain program fish throughout the rearing period.
- Program fish are confined in structures until an active smolting phase and time is achieved.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Broodstock is not collected at this site; see Cowlitz and Lewis Spring Chinook HGMPs.

5.2) Fish transportation equipment (description of pen, tank truck, or container used).

Adults are not transported (see Cowlitz and Lewis Spring Chinook HGMPs).

Green eggs are transported from Cowlitz Salmon Hatchery and/or Lewis River Hatchery to Grays River Hatchery.

Yearlings are transported via tanker truck equipped with oxygen and aeration source from the Grays River Hatchery to the Cathlamet Channel net pen site.

Table 5.2.1. Transportation equipment available at Grays River Hatchery.

Equipment Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Truck with Tank	1200	Y	N	60	None	NA
Truck With Tank	1000	Y	N	60	None	NA

5.3) Broodstock holding and spawning facilities.

Broodstock is not collected at this site; see Cowlitz and Lewis Spring Chinook HGMPs.

5.4) Incubation facilities.

Table 5.4.1: Incubation vessels available at Grays River Hatchery.

Incubator Type	Units (number)	Flow (gpm)	Volume (cu.ft.)	Loading-Eyeing (eggs/unit)	Loading-Hatching (eggs/unit)
Heath Vertical Stacked Tray Units	1	3-5	NA	8,000	8,000

5.5) Rearing facilities.

Fish from green egg-to-yearling stage (15 fpp) are reared at Grays River Hatchery. In March/April, the program is transferred by truck to the net pen sites.

Table 5.5.1: Rearing ponds available at Grays River Hatchery.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Flow Index	Max. Density Index
10	Standard Concrete Raceway	4,800	80	20	3.0	300	1.875	NA

The spring Chinook program utilizes six to eight of these standard raceways. Fish are reared in these raceways until they are approximately 15 fpp. They are mass marked at 100 fpp, and transferred to the Cathlamet Channel net pens for final rearing and release.

5.6) Acclimation/release facilities.

Table 5.5.1: Rearing/holding facilities at Cathlamet Channel net pens.

Pens (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Flow Index	Max. Density Index
1-40	Net Pens	5200	20	20	13.0	NA	U	U

Fish are acclimated to the Cathlamet Channel, Birnie Creek, and mainstem Columbia River tidal influence. Fish have been reared for approximately six months at this site until April/May. The fish are currently released directly from the current net pen sites.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.

- Avian (kingfishers and blue heron) and mammal (otter and mink) predation impact the program and can cause significant mortality.
- The current April/May release timeframe can occur after smolting behavior starts in some years. With smolting behavior, fish stress levels increase with the population using energy trying to escape from the pens. Pushing and swarming against the net pen sides results in

scale loss and body abrasions. Along with elevating temperatures starting in April, overall fish health can deteriorate because of smolt stress.

5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

- The program is distributed over multiple net pen units to reduce overall risk.
- Net pen mesh sizes used are appropriate to retain the fish until smolt stage is reached without premature escape.
- Predator measures of cover nettings and electrical grid fences are used to minimize predation impact.
- Grays River staff provides operational support five times weekly or as needed.
- Grays River staff communicates with fish program and fish health staff for any program or fish health issues.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.

The current program broodstock are derived from marked hatchery fish collected at Cowlitz Salmon and Lewis River (Speelyai) hatcheries (see Cowlitz and Lewis Spring Chinook HGMPs). Cowlitz and Lewis stocks were selected because:

1) Both systems have large production programs that are not currently integrated with natural-origin fish;
2) They are the nearest production programs to the release location; and
3) The stock has a run entry pattern and timing that provides harvest opportunities for fisheries in the lower Columbia mainstem and Washington/Oregon Coast.

6.2) Supporting information.

6.2.1) History.

This is a new program, initiated in 2012.

6.2.2) Annual size.

Program receives a total of 355,000 green eggs from the Cowlitz Salmon Hatchery (CSH) to achieve the release goal of 250,000 smolts. To meet this goal of around 200 pairs of spawning adults are needed annually, based on an average fecundity of 3,920 eggs/female and pre-spawning mortality of 10%. This is in conjunction with broodstock collection for the Cowlitz spring Chinook program, which requires an egg-take of around 2.7-million (see Cowlitz Chinook HGMP). Lewis River spring Chinook will be used as a backup source for this program (see Lewis Spring Chinook HGMP).

6.2.3) Past and proposed level of natural fish in broodstock.

Stock is derived from hatchery returns to the Cowlitz or Lewis rivers. Natural-origin fish are currently not integrated within the Cathlamet net pen broodstock program (see Cowlitz and Lewis Spring Chinook HGMPs).

6.2.4) Genetic or ecological differences.

As of 2002, returning hatchery fish have been adipose fin-clipped and thus can be identified from wild Chinook. Prior to 2002, broodstock was integrated at an unknown level. There are therefore no known genotypic, phenotypic, or behavioral differences between either the hatchery stock or natural stock in the sub-basin.

6.2.5) Reasons for choosing.

The stock has a run-entry pattern and timing that provides harvest opportunities for fisheries in the lower Columbia mainstem and Washington/Oregon Coast. See also HGMP section 6.1.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

- This program is managed as a segregated program, genetically separated from the natural spring Chinook in the Columbia Estuary Basin.
- Only hatchery stock is used.
- Holding pen procedures follow IHOT guidelines.

See also Cowlitz and Lewis spring Chinook HGMPs.

SECTION 7. BROODSTOCK COLLECTION

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

Marked hatchery adults returning to Cowlitz and Lewis rivers (see Cowlitz and Lewis spring Chinook HGMPs).

7.2) Collection or sampling design.

Broodstock is collected at Cowlitz Salmon or Lewis River (Speelyai) hatcheries (see Cowlitz and Lewis spring Chinook HGMPs).

7.3) Identity.

Released hatchery fish are 100% ad-marked (adipose fin-clipped), with 20% Ad+CWT (50,000) so that they can be distinguished from the natural population (see Cowlitz and Lewis River Spring Chinook HGMPs).

7.4) Proposed number to be collected:

See HGMP section 6.2.2.

7.4.1) Program goal (assuming 1:1 sex ratio for adults)

See HGMP section 7.4.

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available

Broodstock not collected at this site; see Cowlitz and Lewis River Spring Chinook HGMPs.

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.

Broodstock not collected at this site; see Cowlitz and Lewis River spring Chinook HGMP.

7.6) Fish transportation and holding methods.

Broodstock not collected at this site; see Cowlitz and Lewis Spring Chinook HGMPs.

7.7) Describe fish health maintenance and sanitation procedures applied.

Broodstock not collected at this site; see Cowlitz and Lewis Spring Chinook HGMPs.

7.8) Disposition of carcasses.

Broodstock not collected at this site; see Cowlitz and Lewis Spring Chinook HGMPs.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

The net pens are located in Cathlamet Channel near the mouth of Birnie Creek (WRIA 25.0281), which will provide attraction water on which returning adults can home, reducing straying effects into other Lower Columbia tributaries.

WDFW operates a weir on the Elochoman River for fall Chinook. WDFW plans to operate this weir during the spring Chinook return to determine if returns from this program enter the Elochoman River (see HGMP section 11.1.1).

See also Cowlitz and Lewis Spring Chinook HGMPs.

SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1) Selection method.

Chinook adults; see Cowlitz and Lewis Spring Chinook HGMPs.

8.2) Males.

No adults collected or spawned at this site; see Cowlitz and Lewis Spring Chinook HGMPs.

8.3) Fertilization.

To maximize effective population size with-in the hatchery broodstock, fertilization occurs in 1:1 mating (females/males); see Cowlitz and Lewis spring Chinook HGMPs.

8.4) Cryopreserved gametes.

Cryopreserved gametes are not used for this program.

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

- Mating cohorts are randomly selected.
- Broodstock will be collected throughout the run time.
- Protocols for population size, fish health disinfection and genetic guidelines followed.

SECTION 9. INCUBATION AND REARING -

Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1) Incubation:

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

Up to 355,000 green eggs are shipped from Cowlitz Salmon and/or Lewis (Speelyai) hatcheries to Grays River Hatchery.

Table 9.1.1.1. Survival rates from incubation to ponding, Cowlitz /Lewis (Speelyai) hatcheries spring Chinook at Grays River Hatchery.

Year	Green Eggs Received	Green-to-Eyeing	Eyed-Eggs-to-Ponding
2012	355,000	90	98
2013	355,000	NA	NA

Source: WDFW hatchery data.

9.1.2) Cause for, and disposition of surplus egg takes.

None. Egg-take is planned according to data/information of historical collection at the Cowlitz and Lewis rivers.

9.1.3) Loading densities applied during incubation.

Eggs are loaded at 8,000 eggs per tray with 5 gpm flow. Removal of dead eggs, accurate enumeration and loadings are adjusted during this time. See HGMP section 5.4 for load and hatching criteria. Integrated Hatchery Operations Team (IHOT) species-specific incubation recommendations are followed for water quality, flows, temperature, substrate, and incubator capacities.

9.1.4) Incubation conditions.

Grays River Hatchery receives green eggs from Cowlitz Salmon or Lewis (Speelyai) hatcheries in the fall (September). Incubation and hatching occurs from vertical incubators. Eyed-eggs on well water have experienced difficulty in shells not breaking down during hatching, which can plug receptacles. Eggs are hatched at this facility are incubated on water from a seasonal unnamed creek adjacent to the hatchery.

9.1.5) Ponding.

Fry are ponded when: a visual inspection of the amount of yolk sac remaining with the yolk slit closed to approximately 1-mm (approximately 1600 TUs) or based on (95% yolk absorption) KD factor. At this time fry are transferred to the appropriate starting raceway (See HGMP section 5.5 for raceway specifications) this usually occurs during the mid-December and continues through January.

9.1.6) Fish health maintenance and monitoring.

Staff conducts daily inspection, visual monitoring and sampling from eyed egg, fry, fingerling, and sub-yearling stages. As soon as potential problems are seen, these concerns are immediately communicated to the WDFW Fish Health Specialist. In regular monitoring, fish health specialists conduct inspections monthly. Potential problems are managed promptly to limit mortality and reduce possible disease transmission.

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

Not applicable at this site, see Cowlitz and Lewis Spring Chinook HGMPs.

9.2) Rearing:

9.2.1) Provide survival rate data (*average program performance) by hatchery life stage (fry to fingerling; fingerling to smolt*) for the most recent twelve years (1988-99), or for years dependable data are available.

Grays River Hatchery. Spring Chinook reared at this facility have suffered only minor mortality due to predation and disease. Bird netting, pond sanitation control measures, and low densities have contributed to this facilities rearing success. Typical loss is usually <10%.

9.2.2) Density and loading criteria (goals and actual levels).

The fish are reared using the loading densities recommended by Piper et al. 1982. Grays River Hatchery programs are kept at or below densities of 3.3 lbs/gpm and 0.5 lbs /cu ft. before the last loading reduction in the fall. Trough maximum loading is 40 lbs at 12 gpm (3.33 lbs/gpm). Tank and raceway maximum loading for early rearing is 132 lbs for the tanks at 40 gpm (3.3 lbs/gpm) and 800 lbs per raceway at 300 gpm. (2.66 lbs/gpm). The final loading per raceway is approximately 3200 lbs. at 300 gpm (10.6 lbs/gpm).

Following some density related studies conducted in the mid-1990s, all net pen projects are programmed not to exceed 0.50 lbs./cf^3 for Chinook.

9.2.3) Fish rearing conditions

Grays River Hatchery. All ponds are broom-cleaned or vacuumed as needed and pressure-washed between broods. Environmental parameters: flow rates, water temperatures, dissolved oxygen and Total Settable Solids (TSS) are monitored on a routine basis thru the rearing period. Temperatures during the rearing cycle range from a high of 60°F to a low of 32°F. Ponds are vacuumed on an as needed basis although generally weekly. Earthen ponds are allowed to dry out before watering up.

Cathlamet Channel net pen site will be monitored for water quality to determine whether any change is occurring in local biochemical composition. Monthly measurements of water chemistry and macro invertebrate populations have been conducted before, during and after each rearing period.

9.2.4) Indicate biweekly or monthly fish growth information (average program performance), including length, weight, and condition factor data collected during rearing, if available.

New program; information not yet available.

9.2.5) Indicate monthly fish growth rate and energy reserve data *(average program performance*), if available.

New program; information not yet available.

9.2.6) Indicate food type used, daily application schedule, feeding rate range (*e.g. % B.W./day and lbs/gpm inflow*), and estimates of total food conversion efficiency during rearing *(average program performance*).

Table 9.2.6.1. Food type, feeding schedule feeding rate and goals, Cathlamet Channel net pen spring Chinook program.

Rearing Period	Food Type	Application Schedule (#feedings/day)	Feeding Rate Range (%B.W./day)	Food Conversion During Period
January-April	Moore Clark Nutra Starter #0, 1, 2	7-5	3.0-2.0	0.75:1.0
May-June	Moore Clark Nutra 1.2 mm	4-1	2.0	0.85:1.0

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.

Fish Health Monitoring. Policy guidance includes: *Fish Health Policy in the Columbia Basin*. Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995). A fish health specialist inspects fish programs at Grays River Hatchery monthly and checks both healthy and if present symptomatic fish. Based on pathological or visual observations by the crew, age of fish and the history of the facility, the pathologist determines the appropriate tests. External signs such

as lesions, discolorations, and fungal growths will lead to internal examinations of skin, gills and organs. Kidney and spleen are checked for bacterial kidney disease (BKD). Blood is checked for signs of anemia or other pathogens. Additional tests for virus or parasites are done if warranted.

Disease Treatment. As needed, appropriate therapeutic treatment will be prescribed to control and prevent further outbreaks. Mortality is collected and disposed of at a landfill. Fish health and or treatment reports are kept on file.

Sanitation. All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy). All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots. Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water. Tank trucks are disinfected between the hauling of adult and juvenile fish. Footbaths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

WDFW staff conducts work at the net pens five days weekly. Observations and weekly progress is communicated to the area Fish Health Specialist monthly. Loss rate above normal <1% per day or problems are reported immediately. After release, net pens are removed from the water, dried and broom cleaned at the hatchery grounds and stored until needed for the next cycle.

9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.

Besides time, size and condition factors, staff can observe aggressive swarming against net pen sides. During final length frequency and weight sampling, staff can observe smolt and parr appearance ratios. Loose scales during feeding events are early signs of smolt development. From past history, hatchery specialists will reduce feed regimes in early spring as fish show signs of smolting. Also at this time feed conversions fall and fish appear leaner with condition factors falling well below 1.0 (K) to 0.90 (K). ATPase activity is not measured.

9.2.9) Indicate the use of "natural" rearing methods as applied in the program.

Grays River Hatchery – not applicable.

Net pen rearing can acclimate fish to environmental conditions in the river. River flows, ambient temperatures, turbidity are natural cues that can help with the fitness of the fish. Also, potential food items such as crustaceans or insects from the river could be attracted to the pens and benefit the fish.

9.2.10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

No listed natural fish are under propagation.

SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

10.1) Proposed fish release levels.

Table 10.1.1. Proposed fish release levels.

Age Class	Max. Number	Size (fpp)	Release Date	Location
Yearling	250,000	10.0	April/May	Cathlamet Channel at RKm 64.3

Source: Future Brood Document 2013.
Note: 10 fpp = 176 mm.

10.2) Specific location(s) of proposed release(s).

Fish are released from the net pens in Cathlamet Channel, on the mainstem Columbia River at approximately RM 40 (RKm 64.3), in the town of Cathlamet, WA and near the confluence with Birnie Creek.

10.3) Actual numbers and sizes of fish released by age class through the program.

This is a new program. The first release (brood year 2012) is in 2014.

10.4) Actual dates of release and description of release protocols.

Net pen sides are lowered to allow fish to swim out of the pens. An option exists to tow the net pen complex to the Columbia mainstem if needed to further avoid further risks to ESA-listed chum salmon.

10.5) Fish transportation procedures, if applicable.

Yearlings (15 fpp) are transported from Grays River Hatchery to the Cathlamet Channel net pens via tanker truck in November/December. Fish are loaded with 6-inch fish pumps and oxygen is supplied through diffuser stones in the tanks. Temperature is monitored in the tank and tempering is performed at the release site if the difference between the tank and the release water is greater than 7ºF. Supplemental oxygen is administered at 2.5 liters per minute. Densities are always less than one pound per gallon. The fish have been released from the net pen locations.

10.6) Acclimation procedures (methods applied and length of time).

Yearlings (15 fpp) are transferred from Grays River Hatchery to the Cathlamet Channel net pens (RM 40 in November/December. Fish are reared and acclimated at the net pen site, in the town of Cathlamet, WA, and released as smolts (10 fpp) in April/May.

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

100% of the releases are mass-marked. Around 20% of the program production (50,000 yearlings) are adipose-fin-clipped/coded-wire tagged; the remainder (200,000 yearlings) are released adipose-clipped only.

10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

The level of fish transferred to the net pen complexes would not exceed program levels so releases would not have surplus numbers.

10.9) Fish health certification procedures applied pre-release.

Prior to release, the population health and condition is established by the Area Fish Health Specialist. This is commonly done 1-3 weeks pre-release and up to 6 weeks on systems with pathogen free water and little or no history of disease. Prior to this examination, whenever abnormal behavior or mortality is observed, staff also contacts the Area Fish Health Specialist. The fish specialist examines affected fish, and recommends the appropriate treatment. Reporting and control of selected fish pathogens are done in accordance with the Co-managers Fish Disease Control Policy (WDFW and WWTIT 1998, updated 2006) and IHOT guidelines.

10.10) Emergency release procedures in response to flooding or water system failure.

Complex manager would contact and inform regional management of the situation. Policy would generally be to retain fish at the site. Net pen operation includes an Emergency Response Plan pursuant to section S6.A-J of the Upland Fin-fish Hatching and Rearing national Pollutant Discharge Elimination System Waste Discharge General Permit that outlines contingency plans in case of emergencies. Emergency release of fish in case of severe flooding could be one of the emergency plan options.

10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

- Net pen sites are geographically isolated from listed fish habitat.
- Siting of the pens has sufficient depth and flow for siting guidelines.
- Program fish are confined in structures until an active smolting phase.
- The production and release of only smolts through fish culture and volitional release practices fosters rapid seaward migration with minimal rearing of delay in the rivers, limiting interactions with naturally produced steelhead juveniles.
- WDFW uses acclimation and release of smolts in lower river reaches where possible, this in an area below known wild fish spawning and rearing habitat.
- All program fish are mass-marked for harvest removal.
- WDFW proposes to continue monitoring, research and reporting of hatchery smolt migration performance behavior, and intra and interspecific interactions with wild fish to access, and adjust if necessary, hatchery production and release strategies to minimize effects on wild fish.
- WDFW fish health and operational concerns for the Cathlamet Channel Net Pen program is communicated to Region 5 staff for risk management or needed treatment. See also HGMP section 9.2.7.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

11.1.1) Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.

Performance indicators for harvest will be accomplished by continuing mass marking (ad clip). CWT recoveries will help determine stray rate contributions on spawning grounds by watersheds close in proximity to this program's release vicinity. See HGMP section 1.10 Monitoring and Evaluation for additional plans and methods to collect data necessary.

Additional research, monitoring and evaluation in the Lower Columbia. WDFW is currently conducting the following Mitchell Act-funded research, monitoring and evaluation projects:

Table 11.1.1.1: Current WDFW Mitchell Act-funded research, monitoring and evaluation projects.

Project	Description
Fish Collection Weirs on the Grays, Coweeman, Washougal and Elochoman Rivers	This project will install, operate and remove fish collection weirs on the lower Grays Coweeman, Washougal and Elochoman rivers. Operation of these weirs will allow WDFW to control the number of hatchery fall Chinook reaching natural spawning locations, thereby benefiting natural production in these basins. Additionally, this project will fund spawning ground survey activities to monitor the effectiveness of these weirs and allow for the calculation of important hatchery performance metrics, such as pHOS. Deliverables include estimates of pHOS, and trapping efficiency, plus a draft Section 10 report for the weir on the Grays River.

11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

Except for a risk involving genetic introgression, all other aspects of the M&E outlined in HGMP section 1.10 are currently funded (see also HGMP section 11.1.1). There is no current research that has estimated the predation risk posed by Chinook releases.

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

Monitoring, evaluation and research follow scientific protocols with adaptive management process if needed. WDFW will take risk aversion measures to eliminate or reduce ecological effects, injury, or mortality as a result of monitoring activities. See HGMP section 1.10 Monitoring and Evaluation for additional plans and methods to collect necessary data. In addition, we will adaptively manage all aspects of the program to continue to minimize associated risks using the more recent available scientific research. .

SECTION 12. RESEARCH

12.1) Objective or purpose.

No current research is directly associated with this program.

12.2) Cooperating and funding agencies.

Not applicable.

12.3) Principle investigator or project supervisor and staff.

Not applicable.

12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

Not applicable.

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.

Not applicable.

12.6) Dates or time period in which research activity occurs.

Not applicable.

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.

Not applicable.

12.8) Expected type and effects of take and potential for injury or mortality.

Not applicable.

12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table" (Table 1).

Not applicable.

12.10) Alternative methods to achieve project objectives.

Not applicable.

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

Not applicable.

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

Not applicable.

SECTION 13. ATTACHMENTS AND CITATIONS

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the information provided is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

ADDENDUM A. PROGRAM EFFECTS ON OTHER (AQUATIC OR TERRESTRIAL) ESA-LISTED POPULATIONS. (Anadromous salmonid effects are addressed in Section 2)

15.1) List all ESA permits or authorizations for USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species associated with the hatchery program.

The WDFW and the USFWS have a Cooperative Agreement pursuant to section 6(c) of the Endangered Species Act that covers the majority of the WDFW actions, including hatchery operations.

> "The department is authorized by the USFWS for certain activities that may result in the take of bull trout, including salmon/steelhead hatchery broodstocking, hatchery monitoring and evaluation activities and conservation activities such as adult traps, juvenile monitoring, spawning ground surveys..."

15.2) Describe USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species and habitat that may be affected by hatchery program.

Several listed and candidate species are found in Clark and Wahkiakum Counties; however the hatchery operations and facilities for this program do not fall within the critical habitat for any of these species. As such there are no effects anticipated for these species.

"No effect" for the following listed species:

Bull trout (*Salvelinus confluentus*) – Threatened (Critical Habitat Designated)
Marbled murrelet (*Brachyramphus marmoratus*) –Threatened (Critical Habitat Designated)
Columbian White-Tailed deer (*Odocoileus virginianus leucurus*) – Endangered
Northern Spotted owl (*Strix occidentalis caurina*) –Threatened (Critical Habitat Designated)
Gray Wolf (*Canis lupus*) –Threatened
Bradshaw's desert-parsley (*Lomatium bradshawii*) –Endangered
Water howellia (*Howellia aquatilis*) –Threatened
Golden Paintbrush (*Castilleja levisecta*) [historic]

Candidate Species:
(Cathlamet) Mazama pocket gopher (*Thomomys mazama* ssp. *louiei*) [historic]
Streaked horned lark (*Eremophila alpestris strigata*)
(Brush Prairie) Mazama pocket gopher *(Thomomys mazama* ssp. *oregonus)*
North American wolverine *(Gulo gulo luteus)* – contiguous U.S. DPS
Oregon spotted frog *(Rana pretiosa)* [historic]

15.3) Analyze effects.

Not applicable.

15.4) Actions taken to minimize potential effects.

Program steelhead are released fully smolted to foster rapid outmigration from the basin and to minimize predation and residualism risks.

15.5) References

Not applicable.

Attachment 1. Definition of terms referenced in the HGMP template.

Augmentation - The use of artificial production to increase harvestable numbers of fish in areas where the natural freshwater production capacity is limited, but the capacity of other salmonid habitat areas will support increased production. Also referred to as "fishery enhancement".

Critical population threshold - An abundance level for an independent Pacific salmonid population below which: depensatory processes are likely to reduce it below replacement; short-term effects of inbreeding depression or loss of rare alleles cannot be avoided; and productivity variation due to demographic stochasticity becomes a substantial source of risk.

Direct take - The intentional take of a listed species. Direct takes may be authorized under the ESA for the purpose of propagation to enhance the species or research.

Evolutionarily Significant Unit (ESU) - NMFS definition of a distinct population segment (the smallest biological unit that will be considered to be a species under the Endangered Species Act). A population will be/is considered to be an ESU if 1) it is substantially reproductively isolated from other conspecific population units, and 2) it represents an important component in the evolutionary legacy of the species.

Harvest project - Projects designed for the production of fish that are primarily intended to be caught in fisheries.

Hatchery fish - A fish that has spent some part of its life-cycle in an artificial environment and whose parents were spawned in an artificial environment.

Hatchery population - A population that depends on spawning, incubation, hatching or rearing in a hatchery or other artificial propagation facility.

Hazard - Hazards are undesirable events that a hatchery program is attempting to avoid.

Incidental take - The unintentional take of a listed species as a result of the conduct of an otherwise lawful activity.

Integrated harvest program - Project in which artificially propagated fish produced primarily for harvest are intended to spawn in the wild and are fully reproductively integrated with a particular natural population.

Integrated recovery program - An artificial propagation project primarily designed to aid in the recovery, conservation or reintroduction of particular natural population(s), and fish produced are intended to spawn in the wild or be genetically integrated with the targeted natural population(s). Sometimes referred to as "supplementation".

Isolated harvest program - Project in which artificially propagated fish produced primarily for harvest are not intended to spawn in the wild or be genetically integrated with any specific natural population.

Isolated recovery program - An artificial propagation project primarily designed to aid in the recovery, conservation or reintroduction of particular natural population(s), but the fish produced are not intended to spawn in the wild or be genetically integrated with any specific natural population.

Mitigation - The use of artificial propagation to produce fish to replace or compensate for loss of fish or fish production capacity resulting from the permanent blockage or alteration of habitat by human activities.

Natural fish - A fish that has spent essentially all of its life-cycle in the wild and whose parents spawned in the wild. Synonymous with *natural origin recruit (NOR).*

Natural origin recruit (NOR) - See *natural fish*

Natural population - A population that is sustained by natural spawning and rearing in the natural habitat.

Population - A group of historically interbreeding salmonids of the same species of hatchery, natural, or unknown parentage that have developed a unique gene pool, that breed in approximately the same place and time, and whose progeny tend to return and breed in approximately the same place and time. They often, but not always, can be separated from another population by genotypic or demographic characteristics. This term is synonymous with stock.

Preservation (Conservation) - The use of artificial propagation to conserve genetic resources of a fish population at extremely low population abundance, and potential for extinction, using methods such as captive propagation and cryopreservation.

Research - The study of critical uncertainties regarding the application and effectiveness of artificial propagation for augmentation, mitigation, conservation, and restoration purposes, and identification of how to effectively use artificial propagation to address those purposes.

Restoration - The use of artificial propagation to hasten rebuilding or reintroduction of a fish population to harvestable levels in areas where there is low, or no natural production, but potential for increase or reintroduction exists because sufficient habitat for sustainable natural production exists or is being restored.

Stock - (see "Population").

Take - To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

Viable population threshold - An abundance level above which an independent Pacific salmonid population has a negligible risk of extinction due to threats from demographic variation (random or directional), local environmental variation, and genetic diversity changes (random or directional) over a 100-year time frame.

Attachment 2. Age class designations by fish size and species for salmonids released from hatchery facilities.
(generally from Washington Department of Fish and Wildlife, November, 1999).

	SPECIES/AGE CLASS	Number of fish/pound	SIZE/CRITERIA Grams/fish
X	Chinook Yearling	<=20	>=23
X	Chinook (Zero) Yearling	>20 to 150	3 to <23
X	Chinook Fry	>150 to 900	0.5 to <3
X	Chinook Unfed Fry	>900	<0.5
X	Coho Yearling 1/	<20	>=23
X	Coho Fingerling	>20 to 200	2.3 to <23
X	Coho Fry	>200 to 900	0.5 to <2.3
X	Coho Unfed Fry	>900	<0.5
X	Chum Fry	<=1000	>=0.45
X	Chum Unfed Fry	>1000	<0.45
X	Sockeye Yearling 2/	<=20	>=23
X	Sockeye Fingerling	>20 to 8000	0.6 to <23
X	Sockeye Fall Releases	>150	>2.9
X	Sockeye Fry	>800 to 1500	0.3 to <0.6
X	Sockeye Unfed Fry	>1500	<0.3
X	Pink Fry	<=1000	>=0.45
X	Pink Unfed Fry	>1000	<0.45
X	Steelhead Smolt	<=10	>=0.45
X	Steelhead Yearling	<=20	>=23
X	Steelhead Fry	>20 to 150	3 to <23
X	Steelhead Unfed Fry	>150	<3
X	Cutthroat Yearling	<=20	>=23
X	Cutthroat Fingerling	>20 to 150	3 to <23
X	Cutthroat Fry	>150	<3
X	Trout Legals	<=10	>=0.45
X	Trout Fry	>10	<0.45

[1] Coho yearlings defined as meeting size criteria and 1 year old at release, and released prior to June 1.
[2] Sockeye yearlings defined as meeting size criteria and 1-year old.