HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Deep River Net Pen Fall Chinook Program
Species or Hatchery Stock:	Chinook *(Oncorhynchus tshawytscha)*
Agency/Operator:	Washington Department of Fish and Wildlife
Watershed and Region:	Columbia River Estuary
Date Submitted:	
Date Last Updated:	August 21, 2012

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Deep River Fall Chinook Net Pen Program

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

Washougal River fall Chinook salmon (*Oncorhynchus tshawytscha*)

ESA Status: Threatened (for Washougal stock)

1.3) Responsible organization and individuals

Name (and title): Mark Johnson
Agency or Tribe: Washington Department of Fish & Wildlife
Address: 165 Osprey Lane, Toledo WA 98591
Telephone: (360) 864-6135
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Fish Management Staff Lead Contact
Name (and title): Wolf Dammers, Region 10 District Biologist
Agency or Tribe: Washington Department of Fish and Wildlife
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Telephone: 360-696-6211 ex 6709
Fax: 360-906-6776 or 6777
Email: Wolfgang.Dammers@dfw.wa.gov

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

National Marine Fisheries Service - 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: Washougal Hatchery Tule Fall Chinook

Broodstock Collection Location:
Resistance board weir trap: Washougal River (WRIA# 28.0159, LLID 1223962455734) at RM 13.7; tributary to the Columbia River via Camas Slough (28.0154) at R.M. 118.1), Lower Columbia River, Washington.

Adult Holding; Spawning; Incubation Location:
Washougal Hatchery: Washougal River (WRIA# 28.0159, LLID 1223962455734) at RM 13.7), Lower Columbia River, Washington

Rearing Location:
Beaver Creek Hatchery: Beaver Creek (25.0247) at RKm 0.8; tributary to the Elochoman River (25.0236) RKm 8.8; tributary to the Columbia River at RKm 58.6), Lower Columbia River, Washington.

Acclimation; Release Location:
Deep River net pens: Deep River (WRIA# 25.0071, LLID 1236973462451) at RKm 6.4 Grays–Elochoman Basin; tributary to the Columbia River at R.M. 20.5), Columbia Estuary Sub-basin, Washington

1.6) Type of program.

Segregated Harvest – uses HxH crosses from Washougal integrated returning stock.

1.7) Purpose (Goal) of program.

Mitigation/Augmentation. The purpose of the 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 National Marine Fisheries Service (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).

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

Summary of risk aversion measures for the Deep River Chinook net pens program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal Intake Screening Effluent Discharge	4.2	*Operation of Net Pen Facilities:* The Deep River Net Pen Facilities meet State water quality guidelines and satisfy all permit requirements including Washington Department of Ecology #1995-SW00373 and Army Corps of Engineers 404 Permit for Navigable waters No. 98-1-01828. The Net Pen Facility meets guidelines not requiring the following permits: "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit (>20,000 lbs total on site production and > 5,000 lbs of fish feed per month).
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 Washougal Hatchery Fall Chinook HGMP.
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	See also 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 are referenced from Northwest Power Conservation Council (NPCC) Artificial Production Review (APR) (NPCC 2001).

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

1.10.1) "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	HGMP updated and re-submitted to NOAA with significant changes or under permit agreement.
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 Washougal Hatchery Fall Chinook HGMP). Adhere to 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.

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.1.3 Program addresses ESA responsibilities	This HGMP has been submitted for program authorization under auspices of the ESA	HGMP is updated to reflect any major changes in program and resubmitted to NOAA fisheries Monitor size, number, date of release and mass-mark quality..
3.2.1. Harvest of hatchery-produced fish minimizes impact	Harvest is regulated to meet appropriate biological	Harvests are monitored by agencies to provide up-to-date

to wild populations	assessment criteria. Mass mark juvenile hatchery fish prior to release to enable state agencies to implement selective fisheries	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 Washougal Fall Chinook HGMP
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 2009. 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)	pHOS = <0.10. At the Washougal Hatchery, the trap provides 100% capture efficiency, and only natural-origin fish are passed upstream. WDFW has plans to possibly utilize genetic samples to get at gene-flow estimates from recent hatchery operations
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 *FishBooks*).
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 80 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
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.	Flow and discharge reported in monthly NPDES reports.

	WDFW water right permit compliance	
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 the net pen site; see Grays River HGMP.
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 inspect 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 Washougal Fall Chinook HGMP
3.7.8 Predation by hatchery fish does not significantly reduce numbers of natural fish	Hatchery juveniles are raised to smolt-size (5.5 fish/lb) and released from the hatchery at a time that fosters rapid migration downstream.	Not available

1.11) Expected size of program.

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

Program requires an egg take of 1,300,000 from HxH crosses of adults returning to Washougal Hatchery. To meet this goal of a total of 1100 females and 1100 males need to be collected annually, based on an average fecundity of 4400 eggs/female and pre-spawning mortality of 10%. This is in conjunction with broodstock collection for the Washougal integrated fall Chinook

program, which requires an egg take of 3,500,000, for a total of 4.8-million eggs taken (see Washougal Hatchery Fall Chinook HGMP)

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

Age Class	Max. No.	Size (fpp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Watershed	Eco-province
Yearling	1,000,000	80	June	Deep River	6.4	Columbia Estuary	Columbia River Estuary

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 fall Chinook program was initiated in 2009. No return data is yet available for these releases

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

The fall Chinook program was initiated in 2009. The net pen facility began operation in 1996.

1.14) Expected duration of program.

The program is on-going with no planned termination.

1.15) Watersheds targeted by program.

Deep River (WRIA# 25.0071), Grays River 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:

None

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 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 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 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).

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").*

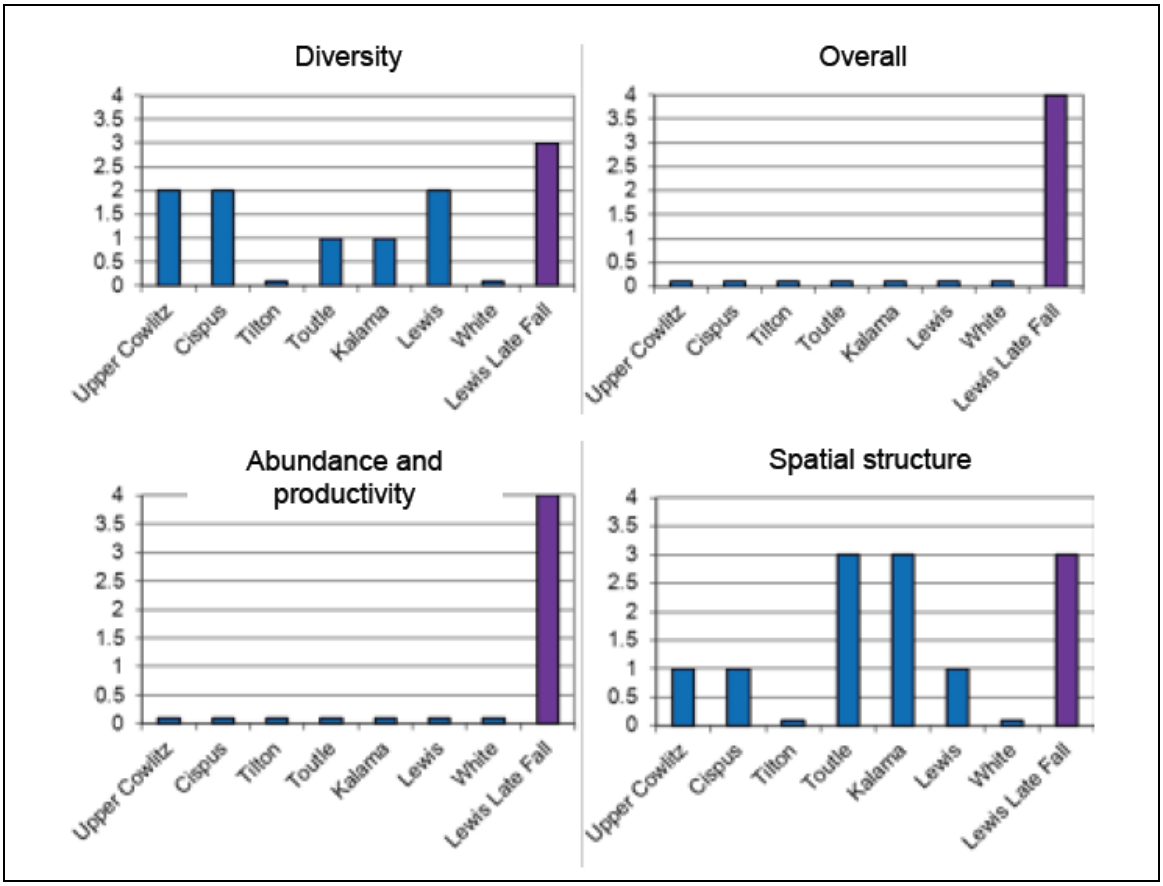
Current extinction risk rate status of historical demographically-independent Lower Columbia River salmon and steelhead populations

River	Chinook		Steelhead		Chum	Coho
	Spring	Fall	Summer	Winter		
Grays River		VH/E		M	M	VH/E
Elochoman River		VH/E		M	VH/E	VH/E
Mill Creek		VH/E		M	VH/E	VH/E
Lower Cowlitz		VH/E		H		VH/E
NF Toutle River	VH/E	VH/E		VH/E		VH/E
SF Toutle River				M		VH/E
Cispus River	VH/E			VH/E	VH/E	VH/E
Tilton River	VH/E	VH/E		VH/E		VH/E
Upper Cowlitz River	VH/E			VH/E		VH/E
Coweeman River		VH/E		H		VH/E
Kalama River	VH/E	VH/E	M	H	VH/E	VH/E
NF Lewis River	VH/E	VH/E	VH/E	VH/E	VH/E	VH/E
EF Lewis River			VH/E	M		VH/E
Salmon Creek		VH/E		VH/E	VH/E	VH/E
Washougal River		VH/E	M	H	VH/E	VH/E
Wind River		VH/E	L	H	L	VH/E
White Salmon River	VH/E	VH/E		H	VH/E	VH/E

L = Low; M = Moderate; H = High; VH/E = Very High/Extinct.
Source: LCRFB 2010

Lower Columbia River Chinook: In Washington, the LCR Chinook ESU includes all naturally spawned Chinook populations from the mouth of the Columbia to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River. Spring Chinook were present historically in the Cowlitz, Kalama, Hood, White Salmon and Lewis rivers.

Status: Of the 32 historical populations in the ESU, 28 are considered extirpated or at very high risk (Ford et al. 2010). Dam construction eliminated habitat for a number of populations leading to their extirpation of spring Chinook salmon populations: Upper Cowlitz River, Cispus River, Tilton River, North Fork Lewis, Big White Salmon, and Upper Cowlitz fall Chinook and Big White Salmon fall Chinook (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; The Big White Salmon Dam was breached October 26, 2011. Based on the recovery plan analyses, all of the tule populations 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 et al. 2010).

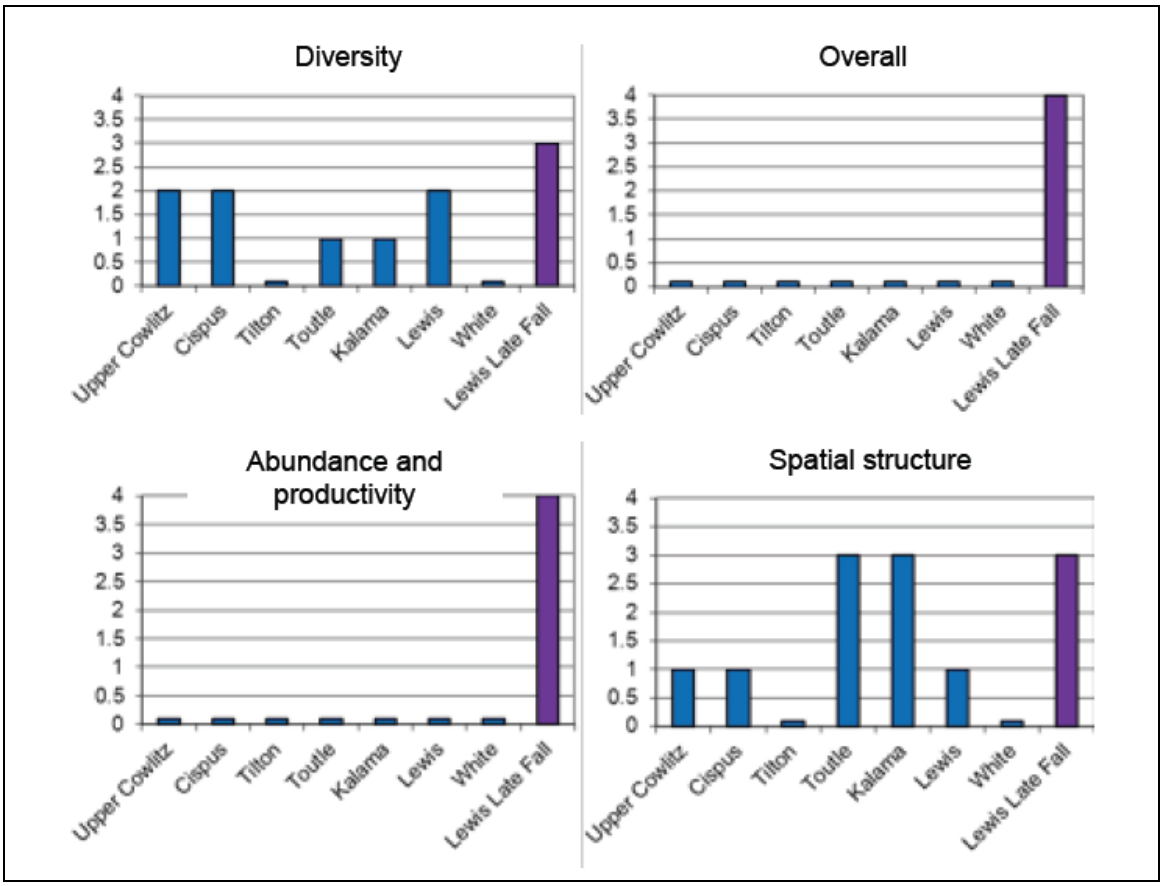


Current status of Washington lower Columbia River spring Chinook and late fall-run (bright) Chinook salmon populations for the VSP parameters and overall population risk. (LCFRB Recovery Plan 2010, chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") and 4 is very low risk (Ford et al. 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, Cowlitz and White Salmon 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. The populations generally remain at relatively low abundance with relatively low productivity (Ford et al. 2010).



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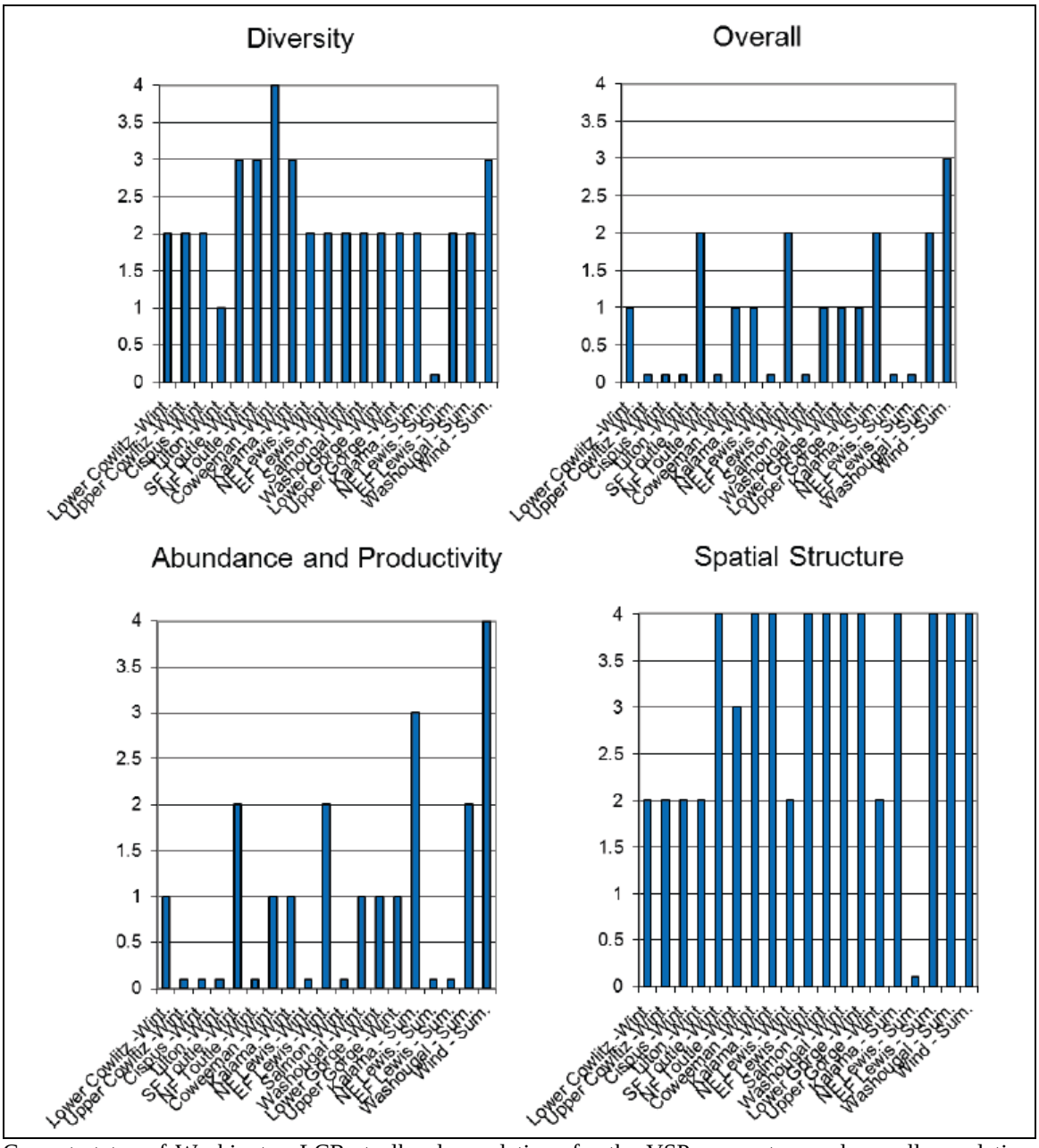
Status: Of the 26 historical populations in the ESU, 17 are considered at high or very high risk. Populations in the upper Lewis, Cowlitz and White Salmon watersheds remain cut-off from access to essential spawning habitat by hydroelectric dams. Projects to allow access have been initiated in the Cowlitz and Lewis systems but these have not yet produced self-sustaining populations. The populations generally remain at relatively low abundance with relatively low productivity (Ford et al. 2010).

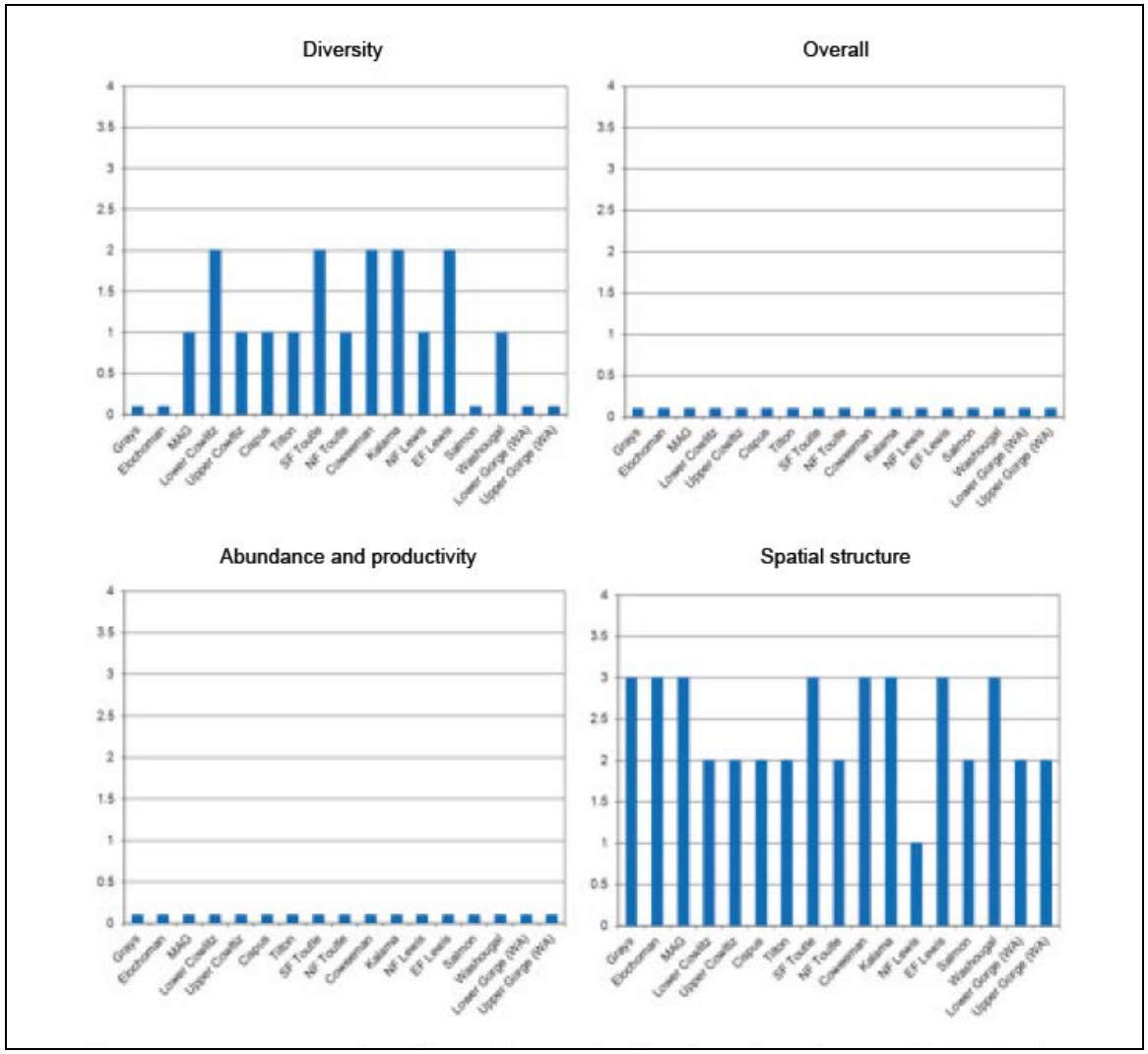


Current status of Washington LCR steelhead populations for the VSP parameters and overall population risk. (LCFRB 2010 Recovery Plan, chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") and 4 is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

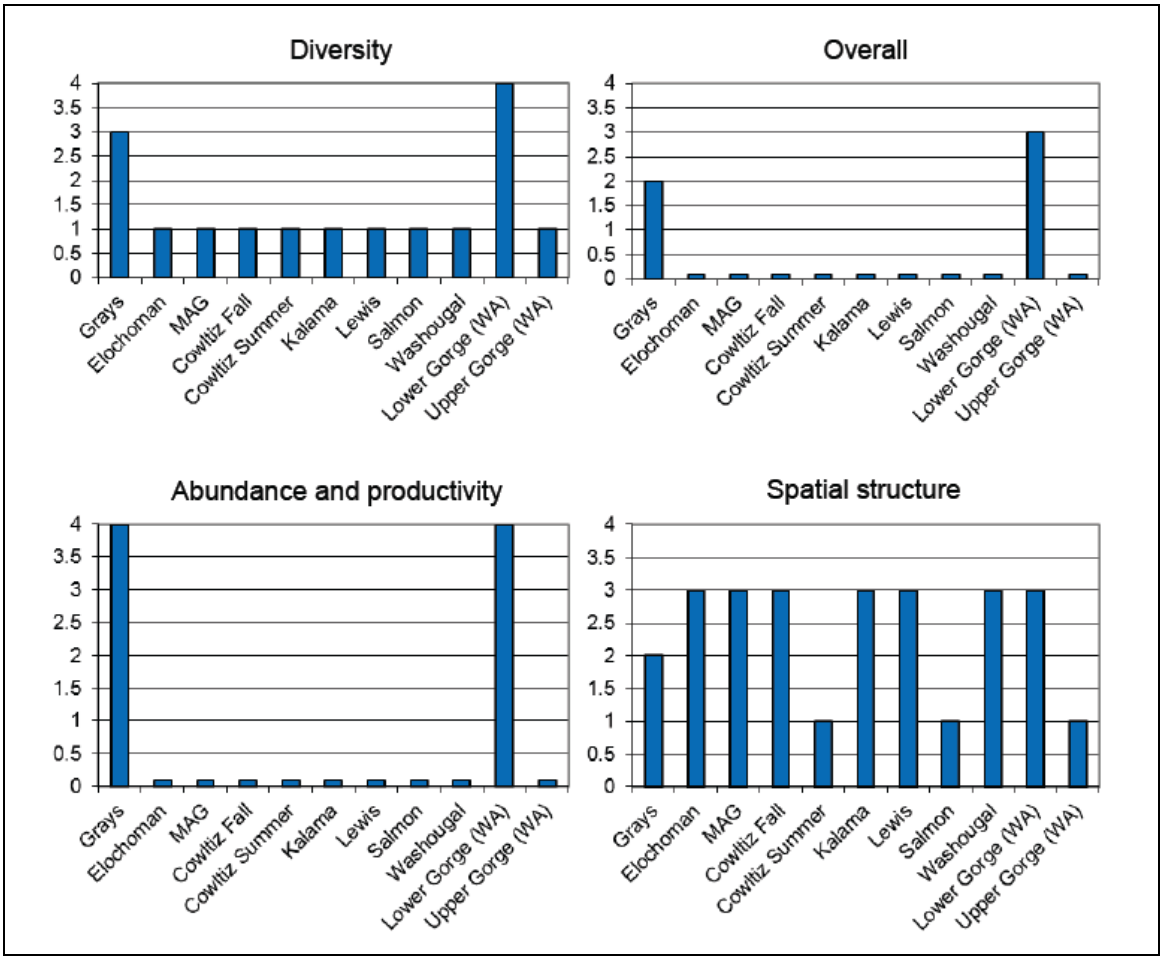
Status: Three status evaluations of LCR coho status, all based on WLC-TRT criteria, have been conducted since the last BRT status update in 2005 (McElhany et al. 2007, Beamesderfer et al. 2010, LCFRB 2010). All three evaluations concluded that the ESU is currently at very high risk of extinction. All of the Washington side populations are considered at very high risk, although uncertainty is high because of a lack of adult spawner surveys. As was noted in the 2005 BRT evaluation, 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 et al. 2010).



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 et al. 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 three artificial propagation programs: Big Creek, Grays River, Lewis River, and Washougal River/Duncan Creek chum hatchery programs.

Status: Of the 27 historical populations in the ESU, 24 are considered at very high risk. The remaining three (Sandy, Clackamas and Scapposse) are considered at high to moderate risk. All of the Washington side populations are considered at very high risk, although uncertainty is high because of a lack of adult spawner surveys. As was noted in the 2005 BRT evaluation, 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 et al. 2010).



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 et al. 2011).

- 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 Section 11.1 for planned M&E. Juvenile coho production estimates is the one measure of production in the Lower Columbia system.

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

Year	Cedar Creek	Mill Creek	Abernathy Creek	Germany Creek	Cowlitz Fall 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	-----	-----
2009	61,140	62,83	3,761	2,576	-----	-----

Source: LCR FMEP Annual Report 2010.

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

Spring Chinook salmon total spawner abundance estimates in LCR tributaries, 1997-2009 (update by Joe Hymer, WDFW)

Year	Cowlitz	Kalama	Lewis	Wind
1997	455	45	417	227
1998	356	46	213	60
1999	285	224	270	99
2000	266	34	523	224
2001	347	578	754	428
2002	419	898	498	566
2003	1,953	790	745	746
2004	1,877	358	529	286
2005	405	380	122	279
2006	783	292	857	207
2007	74	2,150	264	108
2008	425	364	40	75
2009	763	34	80	33

Source: LCR FMEP Annual Report 2009.

Fall Chinook salmon total spawner abundance estimates in LCR tributaries, 1997-2009 (update by Joe Hymer, WDFW)

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
1998	220	144	93	139	2	93	66	4,318	52	5,935	2,971
1999	707	93	303	251	1	303	42	2,617	109	3,184	3,105
2000	121	126	89	25	2	89	27	1,420	323	9,820	2,088
2001	2,354	646	251	536	5	251	132	3,714	530	15,000	3,901
2002	7,581	900	82	372	14	82	450	18,952	1,375	17,106	6,050
2003	6,820	1,090	387	588	10	387	140	24,782	727	20,171	3,444
2004	4,796	1,590	745	2,109	4	745	618	6,680	918	15,907	10,597
2005	2,204	753	149	529	2	149	327	9,272	607	11,023	2,678
2006	332	566	390	7	3	390	216	10,560	441	12,299	2,728
2007	230	251	104	3	1	104	102	3,451	245	3,761	1,704
2008	884	424	80	482	2	80	204	3,877	391	5,700	2,757
2009	1,538	783	173	3	2	173	135	7,704	637	7,952	3,029

Source: LCR FMEP Annual Report 2010.
* Preliminary estimate

Total summer steelhead spawner abundance estimates in the Lower Columbia River (updated by Bryce Glaser, WDFW)

Brood Year	Trap Count	Snorkel Surveys		
	Kalama	EF Lewis	Washougal	Wind
1999	220	139	135	n/a
2000	140	229	140	193
2001	329	271	184	416
2002	454	440	404	669
2003	817	910	607	1,067
2004	632	425	NA	816
2005	400	673	608	542
2006	387	560	636	648
2007	361	412	681	689
2008	237	365	755	637
2009	268*	800	433	622
2010	n/a	n/a	n/a	n/a

Source: LCR FMEP Annual Report 2010.
* Preliminary estimate

Total winter steelhead spawner abundance estimates in the Lower Columbia River, 1997-2010 (updates by Bryce Glaser and Josua Holowatz, WDFW).

Brood Year	Index Redd Surveys					Trap Counts		Index Count
	Coweeman	SF Toutle	Green	EF Lewis	Washougal	NF Toutle	Kalama	Cedar Cr*
1997	108	388	-----	238	92	183	456	78
1998	486	374	-----	376	195	149	425	12
1999	198	562	-----	442	294	133	490	51
2000	530	490	-----			238	829	68
2001	384	348	-----	377	216	185	938	43
2002	298	640	-----	292	286	328	1,377	85
2003	460	1,510	-----	532	764	410	1,719	67
2004	722	1,212	-----	1,298	1,114	249	2,156	45
2005	370	520	222	246	320	166	1,784	35
2006	372	656	592	458	524	300	1,560	23
2007	384	548	410	448	632	155	910	35
2008	722	412	554	548	732	96	668	16
2009	602	498	610	688	418	89	940	24
2010	528	274	n/a	320	232	-----	n/a	-----

Source: LCR FMEP Annual Report 2010.
* Cedar Creek trap Index Count does not represent an estimate of total abundance

Total coho harvest (age 3 adults) in LCMA tributaries, 2001-2008 (Joe Hymer, WDFW).

River System	Tributary Sport Catch (age 3 adults) by Year						
	2002	2003	2004	2005	2006	2007	2008
Grays	35	15	72	73	368	477	929
Elochoman	639	933	122	201	240	465	180
Skamakowa Creek	0	0	0	0	0	0	0
Germany Creek.	0	0	0	0	0	0	0
Mill Creek	0	0	0	0	0	0	0
Kalama	1,465	1,323	534	536	715	793	2,662
EF Lewis	0	0	0	0	0	0	0
NF Lewis	2,091	5,538	3,419	2,961	3,462	5,792	8,51
Lower Cowlitz	9,453	4,410	3,008	2,584	4,949	9,694	12,454
Coweeman	0	0	0	0	0	0	0
Toutle	2,594	1,457	880	543	110	528	2506
Washougal	172	319	103	10	158	30	81
Abernathy	0	0	0	0	0	0	0
Green	860	632	705	142	58	542	1,399
Deep	10	5	0	42	0	227	12
Total	**17,319**	**14,632**	**8,843**	**7,092**	**10,060**	**18,548**	**28,474**

Source: LCR FMEP Annual Report 2010.

Peak spawning ground counts for fall chum salmon in index reaches in the Lower Columbia River, 1997-2009 (M Groesbeck WDFW; Streamnet 2003; John Weinheimer 2010).

Return Year	Grays River[a]				Hamilton Creek[b]			Hardy Creek[b]
	Mainstem	WF Grays	Crazy Johnson Creek	Total	Spawning Channels		Total	
					Hamilton	Spring		
1997	79	55	485	619	182	114	296	173
1998	154	214	145	513	346	237	583	778
1999	222	100	927	1,249	221	165	386	192
2000	1,124	833	249	2,206	255	143	398	24
2001	448	1,630	1,260	3,338	925	486	1,411	835
2002	3,081	5,678	2,954	11,713	1,000	794	1,794	343
2003	5,377	6,162	5,139	16,678	223	628	851	582
2004	4,493	12,372	857	17,722	571	219	790	40
2005	1,172	2,081	1,294	4,547	191	157	348	98
2006	668	1,519	3,368	5,555	188	338	526	188
2007	1,455	2,399	740	4,594	148	100	248	26
2008	228	536	823	1,587	114	112	226	9
2009	36	634	920	1,590	30	113	143	46

Source: LCR FMEP Annual Report 2010.
[a] Peak Counts.
[b] Estimated escapement numbers

- 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. See 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.

Potential hatchery-origin strays from this program into adjacent basins (Grays/Elochoman) are reduced by the use of monitoring weirs (NOAA Section 10(a) Scientific Research Permit #16578) that are in place and operating during the fall Chinook return to trap and remove identified (marked) hatchery fish from the systems.

2.2.3) 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.

- 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 Washougal Hatchery fall Chinook HGMP

Rearing Program
Operation of Hatchery Facilities: 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 Deep River Chinook predation and competition effects on listed salmonids***:** The proposed annual production goal for this program is 1,000,000 fish. This time frame of release could encounter listed fish (emerging Chinook, chum and proposed coho) in the Deep River, Grays River or Sea Resources sub-basins. Chinook are released at 80 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 well below the existing in-stream rearing habitat. Indirect take from predation is unknown.

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.

- 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).

In other HGMPs provided to NOAA (Puget Sound, Upper Columbia), indirect takes from hatchery releases such as predation and competition is highly uncertain and dependant 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. 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 receives Mitchell Act Funding. 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 hatcheries 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).

This program is included in the WDFW (draft) Conservation and Sustainable Fisheries Plan.

See also section 3.1 above.

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.

LCRFB Recovery Plan 2010. The near-term strategy for the Columbia Estuary Tributaries (tributaries that enter from the Washington side of the Columbia, from the mouth to the Deep River) involves limiting fishery impacts on natural populations to ameliorate extinction risks until a combination of measures can restore fishable natural populations. There is no directed Columbia River or tributary harvest of ESA-listed estuary tributary salmon. This practice will continue until the populations are sufficiently recovered to withstand such pressure and remain self-sustaining.

The purpose of each Deep River net pen program is to provide fish for isolated harvest opportunity in the Deep River basin. However, these hatchery programs benefit other fisheries as well. All Deep River net pen fall Chinook are adipose fin-clipped; 90,000 (9%) 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 2009. No harvest data is currently available for Deep River fall Chinook (RMIS 2011).

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:* Outmigrant 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. WDFW is unaware of studies directly evaluating adverse ecological effects to listed salmon.

(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 Deep 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 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.

Beaver Creek Hatchery uses Beaver Creek gravity flow surface water (during the early stages of rearing).

The Deep River Net Pens are located directly in the Deep River (at RKm 6.4) and the river supplies all water to these programs.

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 meet State water quality guidelines and satisfy all permit requirements including Oregon Department of Environmental Quality #101198 and Washington Department of Ecology #1995-SW-00373.

- Pond screens are used in the raceways Beaver Creek Hatchery to hold fish captive until their transfer to the D.R.N.P. Current Beaver Creek intake structures are being modified to make creek water withdrawal for hatchery operations ESA compliant.
- 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.
- Discharge effluents are under NPDES permit guidelines for monthly feed limits and total program production.
- The net pens sites are monitored for water quality to determine whether any change is occurring in local biochemical composition.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Broodstock is not collected at this site; see Washougal Hatchery Fall Chinook HGMPs

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

Adults are not transported. See Washougal Hatchery Fall Chinook HGMPs

5.3) Broodstock holding and spawning facilities.

Broodstock is not collected at this site; see Washougal Hatchery Fall Chinook HGMPs

5.4) Incubation facilities.

Not applicable for this site; see Washougal Hatchery Fall Chinook HGMPs

5.5) Rearing facilities.

Fish from eyed-egg to fry stage (~250 fpp) have been reared in standard ponds at Beaver Creek Hatchery. In March/April, the program is transferred by truck to the net pen sites.

Rearing/holding ponds at Beaver Creek Hatchery.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Flow Index	Max. Density Index
20	Concrete Raceways	2,400	10	80	3	250	4 lbs/ gpm	0.42 lbs/ cuft
10	Concrete intermediate Raceways	135	3	15	3	160	NA	NA
2	Concrete holding/rearing ponds	7,200	12	120	5	2,000	NA	NA
1	Earthen Pond (1.1 acres)	225,000	450	100	5	4,000	NA	NA

The Fall Chinook program utilizes 6-8 of these standard raceways. Fish are reared in these raceways until they are approx. 300-250fpp. Once target size is obtained, they are mass marked and transferred to the Deep River Net Pens for final rearing and release.

Net Pen Site 1: located approximately 1.2 RKm downstream of the State Hwy 4 Bridge. This net pen complex has a total of 40 net pens. This complex has two rows of eight net pens side to side-oriented in the Deep River, north to south.

5.6) Acclimation/release facilities.

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- Deep River Site	5200	20	20	13.0	NA	U	U

Fish are acclimated to the Lower Deep River and mainstem Columbia River tidal influence. Fish have been reared for approximately 3-5 months at this site until June. The fish are currently released directly from the current net pen sites but options of towing the complexes closer to the mainstem Columbia for release will be a future option.

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 June 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.
- Loss of the fish in the program has been estimated at 10-35% in some years.

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 5 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 the Washougal River resistance board weir trap (See Washougal Hatchery Fall Chinook HGMP).

When the program began in 2009, Elochoman Salmon Hatchery fall Chinook (Elochoman stock) was used. Elochoman Hatchery was closed in 2009.

6.2) Supporting information.

6.2.1) History.

Broodstock Source	Origin	Year(s) Used	
		Begin	End
Washougal River fall Chinook tule (Washougal Hatchery)	M	2010	Present
Elochoman fall Chinook (Elochoman Salmon Hatchery)	H	2009	2009

M = Mixed; H = Hatchery

Stock is currently derived from HxH crosses from returns to Washougal Hatchery (an integrated program – see Washougal Fall Chinook HGMP). Washougal stock was selected after Elochoman Hatchery was closed in 2009, because:

1) Broodstock holding capacity was available at Washougal.
2) Current production level returns at Washougal could meet the new production need

3) Washougal receives Mitchell Act funding.

6.2.2) Annual size.

Program requires an egg take of 1,300,000 from HxH crosses of adults returning to Washougal Hatchery. This is in conjunction with broodstock collection for the Washougal integrated fall Chinook program, which requires an egg take of 3,500,000, for a total of 4.8-million eggs taken, To meet this goal of a total of 1100 females and 1100 males need to be collected annually, based on an average fecundity of 4400 eggs/female and pre-spawning mortality of 10%. See also Washougal Hatchery Fall Chinook HGMP.

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

Stock is derived from HxH crosses from returns to Washougal Hatchery (an integrated program). Natural-origin fish are currently not integrated within the Deep River NP broodstock program (see Washougal Hatchery Fall Chinook HGMPs).

6.2.4) Genetic or ecological differences.

Starting in 2002, returning hatchery fish were adipose fin-clipped and thus could be identified from wild Chinook. Before 2002, broodstock was integrated at an unknown level. Because of this there are no known genotypic, phenotypic, or behavioral differences between either the hatchery stock or natural stock in the sub-basin.

Washougal fall Chinook, including Washougal hatchery fall Chinook are genetically different from Grays or Elochoman tule Chinook.

6.2.5) Reasons for choosing.

Describe any special traits or characteristics for which broodstock was selected.

The broodstock chosen has the desired life history traits to meet harvest goals. See also Section 6.2.1.

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.

(e.g. "The risk of among population genetic diversity loss will be reduced by selecting the indigenous Chinook salmon population for use as broodstock in the supplementation program.").

- This program is managed as a segregated program, genetically separated from the natural fall Chinook in the Columbia Estuary Basin
- Only hatchery stock is used.
- Holding pen procedures follow IHOT guidelines.
- Weir/traps on the Grays and Elochoman rivers prevent upstream migration from hatchery strays into the system (see Grays and Elochoman Steelhead HGMPs).

See also Washougal Hatchery Fall Chinook HGMPs

SECTION 7. BROODSTOCK COLLECTION

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

Marked hatchery adults returning to Washougal Hatchery (see Washougal Hatchery Fall Chinook HGMPs

7.2) Collection or sampling design.

Beginning in 2011, broodstock will be collected at the mainstem Washougal resistance board weir (RBW) located at R.M. 13.7. See Washougal Hatchery Fall Chinook HGMPs

7.3) Identity.

Describe method for identifying (a) target population if more than one population may be present; and (b) hatchery origin fish from naturally spawned fish.

Released hatchery fish are 100% AD marked, with 9% are CWT marked, so that they can be distinguished from the natural population (see Washougal Hatchery Fall Chinook HGMPs).

7.4) Proposed number to be collected:

To meet this egg take goal of a total of 1,300,000 from HxH crosses, 1100 females and 1100 males returning to Washougal Hatchery need to be collected annually, based on an average fecundity of 4400 eggs/female and pre-spawning mortality of 10%. (see Washougal Hatchery Fall Chinook HGMP).

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

See Section 7.4

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

See Washougal Hatchery Fall Chinook HGMPs

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

Not applicable for this site; see Washougal Hatchery Fall Chinook HGMPs

7.6) Fish transportation and holding methods.

Not applicable for this site; see Washougal Hatchery Fall Chinook HGMPs

7.7) Describe fish health maintenance and sanitation procedures applied.

Not applicable for this site; see Washougal Hatchery Fall Chinook HGMPs

7.8) Disposition of carcasses.

Not applicable for this site; see Washougal Hatchery Fall 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.

See Washougal Hatchery Fall Chinook HGMPs

<u>SECTION 8. MATING</u>

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

8.1) Selection method.

This program uses HxH crosses only. See also Washougal Hatchery Fall Chinook HGMPs

8.2) Males.

To meet this egg take goal of a total of 1,300,000 from HxH crosses, 1100 females and 1100 males returning to Washougal Hatchery need to be collected annually, based on an average fecundity of 4400 eggs/female and pre-spawning mortality of 10%.

8.3) Fertilization.

To maximize effective population size with-in the hatchery broodstock, fertilization occurs in 1:1 mating (females/males); see Washougal Hatchery Fall Chinook HGMPs

8.4) Cryopreserved gametes.

Not used.

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 from adults arriving at the lower river adult weir.
- 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 1,100,000 eyed-eggs are shipped from Washougal Hatchery to Beaver Creek Hatchery. See Washougal Hatchery Fall Chinook HGMP for green-to-eyed egg survival rates.

Survival rates (%) from eyed-egg to fry, Washougal River fall Chinook reared at Beaver Creek Hatchery, 2009-2011

Brood Year	Eyed Egg to Fry
2009	82.0%
2010	98.0%
2011	98.5%

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 Washougal Hatchery.

9.1.3) Loading densities applied during incubation.

Not applicable at this site; see Washougal Hatchery Fall Chinook HGMPs

9.1.4) Incubation conditions.

Not applicable at this site; see Washougal Hatchery Fall Chinook HGMPs

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 1mm (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 last week of January and continues through February.

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 Washougal Hatchery Fall 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.

Beaver Creek Hatchery. Fall 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%.

Deep River Net pens. Chinook reared at this facility suffer high mortality during rearing in most years. This is exacerbated by the late date of release (May). BKD has been the leading cause of mortality Some relief has been found by selectively using only progeny from adults with low BKD titer. It is not possible to collect all mortalities but loss has been estimated to be 10-35%.

Survival rates (%) from fry to release, Washougal River fall Chinook reared at Deep River net pens, brood years 2009-2011

Brood Year	Fry-to-Release
2009	89%
2010	85%
2011	84%

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

Fall Chinook reared at Beaver Creek Hatchery have more than ample space and water flow. A typical max rearing level would consist of 250K fish at 250 fpp in a 2,400-cuft raceway. These numbers compute to around 0.42 lbs /ft^3.

Following some density related studies conducted in the mid 1990s, all SAFE net pen projects are programmed to not exceed 0.50 lbs./cf3 for Chinook.

9.2.3) Fish rearing conditions

Beaver Creek is monitored for water quality to determine whether any change is occurring in local biochemical composition. Monthly measurements of water quality are taken and reported on the NPDE's permitting documents when this program meets the reporting requirements.

Deep River net pen sites have been 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.

Deep River rearing/acclimation phase (Grays River Hatchery spring Chinook data)

Rearing Period	Length (mm)	Weight (fpp)	Condition Factor	Growth Rate
February	35-40	1,200-800	Na	0.65:1
March	40-51	800-400	Na	0.82:1
April	51-60	400-250	Na	0.96:1
May	60-81	250-100	Na	0.96:1
June	81-88	100-80	Na	0.96:1

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

Same as above, see section 9.2.4.

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*).

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 Beaver Creek 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 5 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.

Beaver Creek 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.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Yearling	1,00,000	80	June	Deep River at RKm 6.4

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

Fish are released from the upper net pen complex at approximately 1.2 RKm downstream of the State Hwy 4 bridge.

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

Release Year	Yearling Release		
	Number	Date	Avg Size (fpp)
2009	700,000	June 1	78.0
2010	700,000	June 24	79.2
2011	862,000	June 23-28	80.8

Data Provided by the Hatchery Data Unit –Hatchery Database (July 2011).

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 chum salmon. (see dates of release in Section 10.3)

10.5) Fish transportation procedures, if applicable.

The fish have been released from the net pen locations. In the future, a tug could be used to tow the net pen complexes closer to the mainstem confluence area.

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

Fish at ~250 fpp are transferred in March/April from the Beaver Creek Hatchery to the Deep River net pens (RKm 6.4). Fish are reared at these net pen sites from ~250 fpp to sub-yearlings (80 fpp). Smolts are acclimated in the net pens at the Deep River site, and are released in June.

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

Around 10% of the program production (90,000 sub-yearlings) are adipose-fin clipped (ad-marked)/coded-wire tagged with the remainder (910,000 sub-yearlings) mass marked (ad-marked-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.
- Discharge effluents are under NPDES permit guidelines for monthly feed limits and total program production.
- The net pens sites are for water quality to determine whether any change is occurring in local biochemical composition.
- 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.
- Release is timed after peak chum emigration has been monitored.

- 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 Deep River Net Pen program is communicated to Region 5 staff for risk management or needed treatment. See also 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 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:

Project	Description	FY 2012 Budget
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.	$300,000.00

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 Section 1.10 are currently funded (see also 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 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.

Not applicable

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:_____

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.