HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	Kalama River Hatchery Summer Steelhead- Skamania Hatchery Transfer to Fallert Creek Hatchery
Species or Hatchery Stock	Kalama Summer Steelhead *(Oncorhynchus mykiss)*
Agency/Operator	Washington Department of Fish and Wildlife
Watershed and Region	Kalama Subbasin/Lower Columbia Province
Date Submitted	nya
Date Last Updated	August 16, 2004

Section 1: General Program Description

1.1 Name of hatchery or program.

Kalama River Hatchery Summer Steelhead- (Skamania Stock via Skamania or Lewis River Transfers)

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

Summer Steelhead *(Oncorhynchus mykiss)*

ESA Status: Not listed and not a candidate for listing

1.3 Responsible organization and individuals.

Name (and title):	Aaron Roberts
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program.

Co-operators	Role
National Marine Fisheries Service	Manager of Mitchell Act Funds

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

Funding Sources
Mitchell Act

Operational Information	Number
Full time equivalent staff	4
Annual operating cost (dollars)	$463,581

The above information for full-time equivalent staff and annual operating cost applies cumulatively to Kalama River Anadromous Fish Programs and cannot be broken out specifically by program. One full FTE staff is located at Fallert Creek Hatchery and resides on station. Additional costs from adult collection thru sub-yearling phase are part of Washougal River /Skamania Hatcheries or Lewis River/Merwin Hatcheries.

1.5 Location(s) of hatchery and associated facilities.

Broodstock source	Skamania Hatchery- North Fork Washougal River
Broodstock collection location (stream, RKm, subbasin)	Skamania Hatchery/N.F. Washougal River/RKm 2.4/Washougal
Adult holding location (stream, RKm, subbasin)	Skamania Hatchery/N.F. Washougal River/RKm 2.4/Washougal
Spawning location (stream, RKm, subbasin)	Skamania Hatchery/N.F. Washougal River/RKm 2.4/Washougal
Incubation location (facility name, stream, RKm, subbasin)	Skamania Hatchery/N.F. Washougal River/RKm 2.4/Washougal; and Vancouver Hatchery/Off-Stream Near Vancouver, WA/Columbia Lower
Rearing location (facility name, stream, RKm, subbasin)	Skamania Hatchery/N.F. Washougal River/RKm 2.4/Washougal; Vancouver Hatchery/Off-Stream Near Vancouver, WA/Columbia Lower; and Fallert Hatchery/Kalama River /RKm 8.2/Kalama

Program is from broodstock thru subyearling phase is done at Skamania or Lewis Hatchery. In late fall sub yearlings are transferred to Fallert Creek for final rearing (fall thru winter and spring release).

1.6 Type of program.

Isolated Harvest Program

1.7 Purpose (Goal) of program.

- Rear, acclimate and release 30,000 smolts into the Kalama River system.
- The goal is to mitigate for activities within the Columbia River basin, which has reduced salmonid populations.
- The purpose is to provide maximum sport harvest recreational summer steelhead selective fisheries within the Kalama River basins under the selective fishery regulations (retention of adipose-clipped fish only).
- For programs designed for selective steelhead harvest, WDFW tries to minimize natural escapement of hatchery fish to protect the genetic diversity of wild stocks and minimize impact on listed fish. The first most commonly used approach for steelhead management is to maximize the difference between hatchery and wild stocks, so that if hatchery fish spawn, they are not likely to interbreed with wild spawners. Strategies used by WDFW to limit genetic and ecological risks include these actions: 1) limit the number of hatchery spawners by providing intense selective fisheries, and maintaining high trapping efficiency at the hatcheries or adult traps that remove hatchery fish prior to spawning; 2) advance the spawning timing of Chambers Creek and Skamania type steelhead stocks, so these fish spawn three months earlier than wild stocks, minimizing interbreeding between these two groups; 3) keep hatchery steelhead spawners in the lower river away from prime wild steelhead spawning areas through lower river releases and acclimation; 4) since the reproductive success of Chambers Creek stock is 11% of wild winter steelhead and Skamania Stock is 18% of wild summer steelhead, the few fish that do survive to spawn will produce few offspring; 5) use hatchery management

practices, acclimation, timing, and lower river releases to limit steelhead residualism and the competition and predation that can occur when steelhead smolts residualize; and 6) Follow the Integrated Hatchery Operations Team (IHOT 1995) guidelines to limit disease risks from hatchery steelhead.

1.8 Justification for the program.

- The program is authorized under the Columbia River Fisheries Development Program, Columbia River Fish Management Plan and U.S. vs. Oregon.
- In order to provide selective fisheries WDFW protects listed fish and provides harvest opportunity through the Fish Management and Evaluation Plan (FMEP 2002). The objectives of the WDFW's FMEP are based on the WDFW Wild Salmonid Policy. In that policy, it states that harvest rates will be managed so that 1) spawner abundance levels abundantly utilize available habitat, 2) ensure that the number and distribution of locally adapted spawning populations will not decrease, 3) genetic diversity within populations is maintained or increased, 4) natural ecosystem processes are maintained or restored, and 5) sustainable surplus production above levels needed for abundant utilization of habitat, local adaptation, genetic diversity, and ecosystem processes will be managed to support fishing opportunities (WDFW 1997). In addition, fisheries will be managed to insure adult size, timing, distribution of the migration and spawning populations, and age at maturity are the same between fished and unfished populations. By following this policy, fisheries' impacts to listed steelhead, chinook salmon, and chum salmon in the Lower Columbia River (LCR) Evolutionary Significant Unit (ESU) will be managed to promote the recovery of these species and not at rates that jeopardize their survival or recovery.

In order to minimize impact on listed fish by WDFW facilities operation and the Kalama River summer steelhead program, the following Risk Aversion are included in this HGMP.

Table 1. Summary of risk aversion measures for the Kalama summer steelhead program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.2	Water rights are formalized thru trust water right #S2-21721 from the Department of Ecology. Monitoring and measurement of water usage is reported in monthly NPDES reports.
Intake Screening	4.2	WDFW has requested funding for future scoping, design, and construction work of a new river intake system on Fallert Creek to meet NOAA compliance (Mitchell Act Intake and Screening Assessment 2002). A new intake structure at Kalama Falls is compliant.
Effluent Discharge	4.2	This facility operates under the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) administered by the Washington Department of Ecology (DOE) - WAG 13-1053.
Broodstock Collection & Adult Passage	7.9	Program does not collect broodstock.
Disease Transmission	2.2.3, 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. See also those sections.

1.9 List of program "Performance Standards".

See HGMP section 1.10.

1.10 List of program "Performance Standards".

1.10.1 Benefits:

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Assure that hatchery operations support Columbia River fish Mgt. Plan *(US v Oregon)*, production and harvest objectives.	Contribute the total harvest for sport, tribal and commercial fisheries. Achieve a 10-year average of 1786 adult harvest. (adults from this program cannot be distinguished from other hatchery summer run steelhead programs in the basin.).	Survival and contribution to fisheries will be estimated for each brood year released. Work with co-managers to manage adult fish returning in excess of broodstock need.
Maintain outreach to enhance public understanding, participation and support of Washington Department of Fish & Wildlife (WDFW) hatchery programs.	Provide information about agency programs to internal and external audiences. For example, local schools and special interest groups tour the facility to better understand hatchery operations. Off station efforts may include festivals, classroom participation, stream adoptions and fairs.	Evaluate use and/or exposure of program materials and exhibits as they help support goals of the information and education program. Record on-station organized education and outreach events.
Program contributes to fulfilling tribal trust responsibility mandates and treaty rights.	Follow pertinent laws, agreements, policies and executive and judicial orders on consultation and coordination with Native American tribal governments.	Participate in annual coordination meetings between the co-managers to identify and report on issues of interest, coordinate management, and review programs (FBD process).
Implement measures for broodstock management to maintain integrity and genetic diversity. Maintain effective population size.	A minimum of 200 adults (Skamania) 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. Adhere to WDFW spawning guidelines. (WDFW 1983) Adhere to WDFW stock transfer guidelines. (WDFW 1991).
Region-wide, groups are marked in a manner consistent with information needs and protocols to estimate impacts to natural and hatchery origin fish.	Use mass-mark (adipose-fin clip) for selective fisheries.	Returning fish are sampled throughout their return for length, sex, and mark.
Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens. Follow Co-managers Fish Health Disease Policy (1998).	Necropsies of fish to assess health, nutritional status, and culture conditions.	WDFW Fish Health Section inspect adult broodstock yearly for pathogens and parasites and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, WDFW's Fish Health Section recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as deemed necessary. 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.

1.10.1 Risks:

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Minimize impacts and/or interactions to ESA listed fish.	Hatchery operations comply with all state and federal regulations. Hatchery juveniles are raised to smolt-size (5.0 – 5.5 fish/lb) and released from the hatchery at a time that fosters rapid migration downstream. Mass mark production fish to identify them from naturally produced fish.	As identified in the HGMP: Monitor size, number, date of release and mass mark quality. Additional WDFW projects: straying, instream evaluations of juvenile and adult behaviors, NOR/HOR ratio on the spawning grounds, fish health documented.
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.	Hatchery goal is to prevent the introduction, amplification or spread of fish pathogens that might negatively affect the health of both hatchery and naturally reproducing stocks and to produce healthy smolts that will contribute to the goals of this facility.	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.
Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring.	NPDES permit compliance WDFW water right permit compliance	Flow and discharge reported in monthly NPDES reports.
Water withdrawals and instream water diversion structures for hatchery facility will not affect spawning behavior of natural populations or impact juveniles.	Hatchery intake structures meet state and federal guidelines where located in fish bearing streams.	Barrier and intake structure compliance assessed and needed fixes are prioritized.
Hatchery operations comply with ESA responsibilities.	WDFW completes an HGMP and is issued a federal and state permit when applicable.	Identified in HGMP and Biological Opinion for hatchery operations.
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 and tribes to provide up to date information.

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

Not applicable to the Kalama summer steelhead program. Broodstock are collected at Skamania Hatchery for a number of Regional programs. See Skamania summer steelhead HGMP.

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

Age Class	Max. No.	Size (ffp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Water-shed	Eco-province
Yearling	30,000 FBD	5.0-5.5	April – May	Kalama	8.2	Kalama	Columbia

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

Wild % of Escap.	Kalama Stock % of Escap.	Brood Year	Wild Escap.	Wild Harvest	Wild Brood Taken	Total Wild Return	Skamania Hatch. Escap.	Kalama Stock H. Escap.	Hatch. Harvest	Hatch. Trap Count	Total Hatch. Return	Planted 2 yrs Previous (Summer)	Smolt to Adult (%)
45%	45%	1990	745	74	0	805	924	0	3609		4533	58201	7.8
41%	41%	1991	704	16	0	721	1034	0	2586		3619	59595	6.1
40%	40%	1992	1075	5	0	1080	1588	0	2612		4201	85960	4.9
32%	32%	1993	2283	204	0	2488	4905	0	4433		9338	68019	13.7
27%	27%	1994	1041	72	0	1113	2797	0	2775		5572	89171	6.2
43%	43%	1995	1302	9	0	1311	1741	0	1573		3314	92525	3.6
35%	35%	1996	614	15	0	629	1150	0	501		1651	100892	1.6
Preliminary Escapement Estimates for Brood Years Below													
20%	20%	1997	598	38	0	636	2395	0	1012		3407	75930	4.5
27%	27%	1998	205	2	0	207	555	0	946	709	2210	80130	2.8
54%	54%	1999	220	26	48	294	187	0	363	735	1285	77941	1.6
82%	82%	2000	140	71	39	250	30	0	1147	1232	2409	66300	3.6
85%	85%	2001	286	38	49	373	52	0	2340	862	3254	89400	3.6
71%	73%	2002	454	41	58	553	184	44	1472	1151	2807		54%
		2003	805	91	60	956	47	805	5235	4430	10470	100518	5.2
50%	97%	2003b	817	116**	70	1003	47	817					

Data provided by Pat Hulett (WDFW).

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

The first year of fish culture operations for Kalama Falls hatchery was 1958, Fallert Creek has been in operation since 1895. Hatchery steelhead have been planted since the 1970's as outplants from other programs (Skamania and Lewis systems).

1.14 Expected duration of program.

A hatchery summer steelhead program for selective fisheries in the Kalama River is an on-going program.

1.15 Watersheds targeted by program.

Kalama Subbasin/Lower Columbia Province

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

The sole purpose of the release of Skamania stock summer steelhead into the Kalama is to continue a summer steelhead sport fishery while eliminating a directed harvest on wild summer steelhead. Smolts are released from the lowest location possible on the Kalama River to encourage returns to remain in the heart of the sport fishery so that they are highly susceptible to harvest. Returning hatchery steelhead that are trapped at Kalama Falls are marked and returned to the lower river for additional harvest opportunity. If they are trapped at Kalama Falls a

second time, they are trucked to Kress Lake for additional sport harvest in a closed system. Any adults that escape the fishery may spawn in the system, but the barrier at Kalama Falls provides a measure of separation between these hatchery steelhead and the main spawning area of the wild summer steelhead.

1.16. 2 Potential Alternatives to the Current Program

Alternative 1: Eliminate the non-local program and use the native stock for this program. WDFW is currently involved in a research project on the Kalama River that will provide information on the feasibility of using the native population. This alternative would require utilizing the local stock, which could not occur without better knowledge of the condition of the wild stock.

Alternative 2: Eliminate the program. This action would significantly reduce potential interaction with the natural population and eliminate impacts on other ESA listed species. This alternative is not considered acceptable, currently this program supports a very popular sport fishery in the Kalama River and elsewhere.

1.16.3 Potential Reforms and Investments

Reform/Investment 1: If the local stock were to be used for this program, investments into the rearing and holding systems will need to happen. The rearing system would require smaller rearing vessels as well as some heated water to accelerate growth to make one year smolts from stock across the entire run time. The cost to perform such a modification is currently estimated to be in the range.

Reform/Investment 2: Adult sorting and handling in general is very hard on adult fish and routinely causes mortality that can be prevented with a modern sorting and handling system designed to cause the least harm possible to all fish handled. A semi-automated sorting system would be comprised of the following: An initial holding pond would collect and hold the fish until sorting is initiated by opening a gaiter, which allows adults to be attracted through a false weir and onto a fabricated, sloped, sorting chute. The chute contains paddles and side chutes. The side chutes lead to different adult ponds, and also provide returns to the river above and below the in stream barrier. An observer located in a control tower above the main chute identifies the fish as it enters the chute and then activities in of the paddles to direct the fish to the desired location. Staff does not physically handle the fish during this sorting process. Adults desired for spawning are directed into the adult ponds equipped with mechanical crowders and a spawning shed at the soppy end. There the adults can be held, crowded, sorted and spawned. Most adult ponds have a river return option as part of the sorting and piping associated with the ponds.

Reform/Investment 3: If the local stock were to be used for this program, monitoring and evaluation will be needed to insure that the survival of the native population is not impacted and to decrease the risk of impacting other ESA listed species. Additional tributary trapping facilities would be needed to collect genetic tissue samples from adults. Costs for monitoring and evaluation are currently estimated to be in the range $$$$.

The hatchery program is a part of a strategy to meet conservation and/or harvest goals for the target stock. The tables below indicate what the short- and long-term goals are for the stock in terms of stock status (biological significance and viability), habitat and harvest. The letters in the table indicate High, Medium, or Low levels for the respective attributes. Changes in these levels from current status indicate expected outcomes for the hatchery program and other strategies (including habitat protection and restoration).

	Biological Significance	Viability	Habitat
Current Status	L	H	H
Short-term Goal	L	H	H
Long-term Goal	L	H	H

Section : Program Effects on ESA-Listed Salmonid Populations

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

This program is described in " Biological Assessment For The Operation Of Hatcheries Funded by The National Marine Fisheries Service (March 99)". WDFW is writing HGMP's to cover all programs produced at Kalama Complex including; fall and spring Chinook, coho, summer and winter run steelhead.

2.2.1 Descriptions, status and projected take actions and levels for ESA-listed natural populations in the target area.

The following ESA listed natural salmonid populations occur in the subbasin where the program fish are released:

ESA listed stock	Viability	Habitat
Fall Chinook	H	M
Spring Chinook	L	M
Summer Steelhead (Local)	M	M
Winter Steelhead (Local)	M	M
Coho- Natural and Hatchery (Proposed)	Na	Na
H, M and L refer to high, medium and low ratings, low implying critical and high healthy.		

Identify the ESA-listed population(s) that will be directly affected by the program.
None.

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

Lower Columbia River fall chinook salmon *(Oncorhynchus tshawytsch*a) are federally listed as "threatened" under the ESA on March 24, 1999.
Lower Columbia River spring chinook salmon *(Oncorhynchus tshawytsch*a) are federally listed as "threatened" under the ESA on March 24, 1999.
Lower Columbia River Steelhead *(Oncorhynchus mykiss*), were listed as threatened under the ESA on March 19, 1998. In Washington, the LCR steelhead ESU includes winter and summer steelhead in tributaries to the Columbia River between the Cowlitz River and Wind River.
Lower Columbia River Coho (*Oncorhynchus kisutch*) is currently a candidate for listing (proposed as threatened on June 14, 2004).

2.2.2 Status of 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. Critical and Viable population thresholds have not been established for these ESUs and the populations within them. NMFS has formed a Lower Columbia River/Willamette River Technical Review Team (TRT) to review population status within the ESU and develop critical and viable population thresholds.

Lower Columbia River fall chinook salmon *(Oncorhynchus tshawytsch*a) within the Evolutionary Significant Unit (ESU) are federally listed as "threatened" under the Endangered Species Act effective May 24, 1999.

Status: WDFW has submitted natural and hatchery draft management guidelines for Kalama fall chinook that will be used in the interim until the TRT recommendations are developed (Fall 2003). In Washington, the LCR chinook ESU includes all naturally spawned chinook populations from the mouth of the Columbia River to the Cascade Crest. Native fall chinook have been reported in the Kalama, but a distinct stock no longer exists. The Kalama River fall chinook natural spawners are a mixed stock of composite production with a significant portion of the natural spawners hatchery produced fish. Kalama fall chinook are rated healthy because escapements have usually exceeded the escapement goal of 2,000 adults (SaSI 2002). Natural spawning abundance has exceeded 20,000 spawners, with spawning escapements from 1986-2001 ranging from 1,420 to 24,297 (average 6.287) but escapement levels have normally ranged from 2,000 to 4,000 since 1990. Although final escapement objectives have not been established by the NMFS through a recovery plan, WDFW has established draft interim minimum escapement objectives. The minimum fall chinook MSY escapement goal is 400 to 450 adult spawners passed above the weir (based on habitat between the weir and Kalama Falls Hatchery). Since some fish swim through the weir, this would lead to an escapement of 444 to 500 spawners in most years. In addition, there is a significant amount of spawning that occurs below the Modrow weir.

Table 2. Fall chinook salmon abundance estimates in the LCMA (FMEP 2003)

Year	Cowee-man River	Cowlitz River	Green River	Toutle River	Kalama River	EF Lewis River	NF Lewis River	Washougal River	Wind River Bright	Wind River Tule
1990	241	2,698	123		20,54	342	17,506	2,062	177	11
1991	174	2,567	123	33	5,085	230	9,066	3,494	269	52
1992	424	2,489	150		3,593	202	6,307	2,164	51	54
1993	327	2,218	281	3	1,941	156	7,025	3,836	686	0
1994	525	2,512	516	0	2,020	395	9,939	3,625	1,101	11
1995	774	2,231	375	30	3,044	200	9,718	2,969	278	4
1996	2,148	1,602	667	351	10,630	167	14,166	2,821	58	166
1997	1,328	2,710	560		3,539	307	8,670	4,529	220	148
1998	144	2,108	1,287	66	4,318	104	5,929	2,971	953	202
1999	93	997	678	42	2,617	217	3,184	3,105	46	126
2000	126	2,700	852	27	1,420	323	9,820	2,088	25	14
2001	646	5,013	4,951	132	3,714	530	15,000	3,901	217	444
2002	Na	Na	Na	Na	Na	Na	Na	Na	Na	Na
2003	Na	Na	Na	Na	Na	Na	Na	Na	Na	Na

Lower Columbia River spring chinook salmon (*Oncorhynchus tshawytscha*) within the Evolutionary Significant Unit (ESU) are federally listed as "threatened" under the Endangered Species Act effective May 24, 1999. Critical and Viable population thresholds have not been established for these ESUs and the populations within them. NMFS has formed a Lower Columbia River/Willamette River Technical Review Team (TRT) to review population status within the ESU and develop critical and viable population thresholds. Reports of considerable historic numbers of spring chinook in the Kalama have not been verified and by the 1950s, only remnant (<100) spring chinook runs existed on the Kalama. Kalama spring chinook are a mixed stock with composite production and one of four spring chinook populations in the Columbia River Evolutionarily Significant Unit. Currently, natural spawning is concentrated on the mainstem Kalama between the Kalama Falls (RM 10.5) and Fallert Creek (Lower Kalama) Hatcheries (RM 4.8). Spring chinook enter the Kalama River from March through July with wild spring chinook passed above Lower Kalama Falls with spawners having been observed up to upper Kalama Falls (RM 36.8). Kalama River spawning escapements from 1980-2001 ranged from 0 to 2,892 (average 444). Hatchery strays account for most spring chinook spawning in the

Kalama River although integration of wild and hatchery adults above Kalama Falls can be monitored.

Table 3 . Spring chinook salmon abundance estimates in the LCR (included hatchery and wild fish, FMEP 2003).

Year	Cowlitz	Kalama	Lewis	Wind
1990	320	34	1,419	173
1991	284	34	1,632	141
1992	279	168	1,328	248
1993	236	100	1,429	657
1994	167	408	478	50
1995	347	392	279	32
1996	36	272	504	425
1997	455	45	417	227
1998	356	46	213	60
1999	285	224	270	99
2000	266	34	439	216
2001	347	578	475	412
2002	Na	Na	Na	Na
2003	Na	Na	Na	Na

Lower Columbia River Steelhead *(Oncorhynchus mykiss*), were listed as threatened under the ESA on March 19, 1998. In Washington, the LCR steelhead ESU includes winter and summer steelhead in tributaries to the Columbia River between the Cowlitz River and Wind River. Critical and Viable population thresholds have not been established by the Lower Columbia River/Willamette River Technical Review Team (TRT). Winter steelhead stock status is rated healthy in 2002 because this stock has maintained relatively stable escapement estimates within the normal range of variation (SaSI 2002). An escapement goal of 1,000 fish has been established for this native stock with wild production. Kalama summer steelhead are rated depressed based on a short-term severe decline in escapement from 1998 through 2001. The escapement goal for this stock is 1,000 adult spawners. Escapements in 1998 through 2001 have been only 14% to 33% of the goal. This is a native stock with wild production. Summer and winter steelhead have been observed spawning in the same area therefore runs are not always reproductively separate. Genetic sampling was conducted in 1994, however the collection (juveniles) may contain both summer and winter steelhead, so comparisons of this collection with other collections are not very informative and (Myers et al. 2002). An estimated 40% of returning naturally produced adults had at least one hatchery parent; however, wild stock has retained genetic traits of considerable adaptive value relative to the transplanted hatchery stock (Hulett and Leider 1989). Spawning occurs above Lower Kalama Falls in the mainstem and NF Kalama River and throughout many tributaries, including Gobar, Elk, Fossil, and Wild Horse Creeks with falls at RM 36.8 blocking upstream migration. WDW estimated potential summer and winter steelhead smolt production was 34,850; naturally-produced steelhead smolts migrating annually from 1978-1984 ranged from 11,175 to 46,659. Wild summer steelhead sport harvest in the Kalama River from 1977-1999 ranged from 5 to 2,978; since 1986 regulations limit harvest to hatchery fish. Between 1989-2000 annual proportions of listed natural-origin fish on natural spawning grounds ranged from 0.45 to 1.00 and averaged 0.68 for that 12 year period (see Table 4 below). Since 1998, all direct hatchery-origin winter-run adults (the target stock of this HGMP) have been removed from the Kalama River at the trap at RM 10 and recycled back into the lower river fishery. The current management plan is to continue this program so that the primary steelhead spawning and rearing habitat above the trap site is accessible to the indigenous wild winter-run stock only. The only exception to this is the likely future passage of a small number of returning hatchery adults from the winter-run wild

broodstock program (i.e., just enough to replace the expected production lost from the removal of wild broodstock fish the previous generation).

Table 4. Abundance of hatchery and wild summer run steelhead in the Kalama River basin by Return Year. Note that 1980 and 1981 are the years affected by the eruption of Mt. St. Helens and many of the apparent spawners in those years originated from out of the Kalama River basin. Wild return for BY 1998 and 1999 include spawners used as broodstock. Source is the WDFW Historical Data Base.

Return	Sport Harvest			Escapement			Total Run size		
Year	Hatchery	Wild	H&W Total	Hatchery	Wild	H&W Total	Hatchery	Wild	H&W Total
1977/78	4,304	633	4,937	3,539	1,015	4,554	7,843	1,648	9,491
1978	1,788	1,079	2,867	2,120	484	2,604	3,908	1,563	5,471
1979	1,623	832	2,455	1,929	718	2,647	3,552	1,550	5,102
1980	7,963	844	8,807	8,598	2,926	11,524	16,561	3,770	20,331
1981	4,077	2,978	7,055	12,301	1,385	13,686	16,378	4,363	20,741
1982	7,912	1,075	8,987	4,405	869	5,274	12,317	1,944	14,261
1983	919	1,621	2,540	908	247	1,155	1,827	1,868	3,695
1984	2,129	738	2,867	1,106	461	1,567	3,235	1,199	4,434
1985	3,517	854	4,371	2,424	473	2,897	5,941	1,327	7,268
1986	7,526	148	7,674	4,687	445	5,132	12,213	593	12,806
1987	4,103	217	4,320	2,199	848	3,047	6,302	1,065	7,367
1988	4,603	90	4,693	2,692	492	3,184	7,295	582	7,877
1989	3,398	74	3,472	924	731	1,655	4,322	805	5,127
1990	2,510	16	2,526	1,034	704	1,738	3,544	720	4,264
1991	2,284	5	2,289	1,588	1,075	2,663	3,872	1,080	4,952
1992	4,040	204	4,244	4,905	2,283	7,188	8,945	2,487	11,432
1993	2,559	72	2,631	2,797	1,041	3,838	5,356	1,113	6,469
1994	1,488	9	1,497	1,741	1,302	3,043	3,229	1,311	4,540
1995	521	4	525	1,150	614	1,764	1,671	618	2,289
1996	1,012	38	1,050	2,395	598	2,993	3,407	636	4,043
1997	946	2	948	555	205	760	2,210	207	2,417
1998	363	26	389	187	220	407	1,285	294	1,579
1999	1,147	71	1,218	30	140	170	2,409	250	2,659
2000	2,320	38	2,358	52	286	338	3,254	373	3,627
2001	1,377	41	1,418	228	454	682	2,807	553	3,360
2002	2,657	58	2,715	852	805	1,657	10,470	956	11,426
2003				1,138	632	1,770			

Lower Columbia River Coho (*Oncorhynchus kisutch*) is proposed as threatened on June 14, 2004.

Status: Status: NMFS concludes that the LCR coho ESU includes all naturally spawned populations of coho salmon in the Columbia River and its tributaries from the mouth of the Columbia up to and including the Big White Salmon and Hood Rivers. Twenty-one artificial propagation programs are considered to be part of the ESU as NMFS has determined that these artificially propagated stocks are genetically no more than moderately divergent from the natural populations (NMFS, 2004b). Late stock coho (or Type N) were historically produced in the Kalama basin with spawning occurring from late November into March. Early stock coho (or Type S) were historically produced in the Kalama basin with spawning occurring from October to mid November. Columbia River early and late stock coho produced from Washington hatcheries are genetically similar. Kalama River wild coho run is a fraction of its historical

size. An escapement survey in the late 1930s observed 1,422 coho in the Kalama River. In 1951, WDF estimated coho escapement to the basin was 3,000; both early and late coho were present. Hatchery production accounts for most coho returning to the Kalama River. Natural coho production is presumed to be very low. Electrofishing for juveniles in the Little Kalama River (a major tributary downstream of Kalama Falls) in 1994 and 1995 showed no coho but good numbers of steelhead. Coho have been planted in the Kalama basin since 1942; releases were increased substantially in 1967. The coho program at the two Kalama hatchery complexes was greatly reduced in recent years because of federal funding cuts; the remaining coho program is about 700,000 smolts released annually, split evenly between early stock (reared at Fallert Creek) and late stock (reared at Kalama Falls). (LCFRB Kalama Subbasin Report Volume II, Chapter 10).

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

Describe hatchery activities: The following activities listed below are identified as general hatchery actions that are identified in the ESA Section 7 Consultation "Biological Opinion on Artificial Propagation in the Columbia River Basin" (March 29, 1999).

Broodstock Program:

Broodstock Collection: See Skamania Hatchery summer steelhead HGMP. No direct take of listed fish is associated with this program.

Genetic introgression: When hatchery and wild salmon interbreed genetic material is exchanged between both groups. Listed steelhead are separated from hatchery spawners by timing and by being passed into more suitable habitat above Kalama Falls. Strategies used by WDFW to limit genetic and ecological risks include these actions: 1) limit the number of hatchery spawners by providing intense selective fisheries, and maintaining high trapping efficiency at the hatcheries or adult traps that remove hatchery fish prior to spawning; 2) advance the spawning timing of Chambers Creek and Skamania type steelhead stocks, so these fish spawn three months earlier than wild stocks, minimizing interbreeding between these two groups; 3) keep hatchery steelhead spawners in the lower river away from prime wild steelhead spawning areas through lower river releases and acclimation; 4) since the reproductive success of Chambers Creek stock is 11% of wild winter steelhead and Skamania Stock is 18% of wild summer steelhead, the few fish that do survive to spawn will produce few offspring (Kalama River Research); 5) use hatchery management practices, acclimation, timing, and lower river releases to limit steelhead residualism and the competition and predation that can occur when steelhead smolts residualism. Indirect take from genetic introgression is unknown.

Rearing Program:

Operation of Hatchery Facilities: Water withdrawal is permitted, intake and screening compliance has been assessed and solutions identified. Hatchery effluent discharges fall within NPDES guidelines. Indirect take from this operation is unknown.

Disease: Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1994) chapter 5 have been instrumental in reducing disease outbreaks. It is possible that hatchery fish which have been infected by transmissible pathogens or effluent from hatcheries with sick fish could infect wild fish and hatchery effluent is not tested for pathogens, so we do not know if pathogens are released into the environment. But, releases do not introduce pathogens not already existing in the local populations and disease transmission from hatchery to wild fish is unlikely due to the spatial separation between wild and hatchery fish (Tynan 1999). In addition, although pathogens may cause post release mortality in fish from hatcheries there is

little evidence that hatchery origin fish routinely infect natural populations of salmon and steelhead in the Pacific Northwest (Enhancement Planning Team 1986; foot et al. 2000; Stewart and Bjornn 1990). Indirect take from disease effects 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. The current program release of 30,000 is a 63 % reduction from the average releases the last twelve years (WDFW Historical Database Files). Indirect take from density dependent effects is unknown.

Competition: Salmon and steelhead feed actively during their downstream migration (Becker 1973; Muir and Emmelt 1988; Sager and Glova 1988) and if they do not migrate they can compete with wild fish. WDFW is unaware of any studies that have empirically estimated the competition risks to listed species posed by the program described in this HGMP. Studies conducted in other areas indicate that this program is likely to pose a minimal risk of competition:

1) As discussed above, coho salmon and steelhead released from hatchery programs as smolts typically migrate rapidly downstream. The SIWG (1984) concluded that "migrant fish will likely be present for too short a period to compete with resident salmonids." On station release in large systems may travel even more rapidly – migration rates of approximately 20 river miles per day were observed by steelhead smolts in the Cowlitz River (Harza 1998).
2) NMFS (2002) noted that "...where interspecific populations have evolved sympatrically, chinook salmon and steelhead have evolved slight differences in habitat use patterns that minimize their interactions with coho salmon (Nilsson 1967; Lister and Genoe 1970; Taylor 1991). Along with the habitat differences exhibited by coho and steelhead, they also show differences in foraging behavior. Peterson (1966) and Johnston (1967) reported that juvenile coho are surface oriented and feed primarily on drifting and flying insects, while steelhead are bottom oriented and feed largely on benthic invertebrates."
3) Flagg et al. (2000) concluded, "By definition, hatchery and wild salmonids will not compete unless they require the same limiting resource. Thus, the modern enhancement strategy of releasing salmon and steelhead trout as smolts markedly reduces the potential for hatchery and wild fish to compete for resources in the freshwater rearing environment. Miller (1953), Hochachka (1961), and Reimers (1963), among others, have noted that this potential for competition is further reduced by the fact that many hatchery salmonids have developed different habitat and dietary behavior than wild salmonids." Flagg et al (2000) also stated "It is unclear whether or not hatchery and wild chinook salmon utilize similar or different resources in the estuarine environment."
4) Fresh (1997) noted that "Few studies have clearly established the role of competition and predation in anadromous population declines, especially in marine habitats. A major reason for the uncertainty in the available data is the complexity and dynamic nature of competition and predation; a small change in one variable (e.g., prey size) significantly changes outcomes of competition and predation. In addition, large data gaps exist in our understanding of these interactions. For instance, evaluating the impact of introduced fishes is impossible because we do not know which nonnative fishes occur in many salmon-producing watersheds. Most available information is circumstantial. While such information can identify where inter- or intra specific relationships may occur, it does not test mechanisms explaining why observed relations exist. Thus, competition and predation are usually one of several plausible hypotheses explaining observed results."

Predation (Freshwater): The magnitude of predation will depend upon the characteristic of the population of salmonids, the habitat in which the population occurs, overall food availability besides fish and the characteristics of the hatchery program (e.g., release time, release location, number released, and size of fish released). Steelhead releases could encounter rearing and emigrating listed chinook, steelhead and chum in the Kalama subbasin and Columbia mainstem and pose a predation risk to fish 69-70 mm fl or less.

Predation Risk Factors:

Environmental Characteristics: These characteristics can influence the level of predation (see SIWG (1984) for a review) with risk greatest in small systems during periods of low flow and high clarity. The Kalama system is a large river with annual flows ranging from a high of 4,500 cfs during the winter to a low of 300 cfs in late summer. During April to June, average flows of more than 1,000 cfs are available for dispersal and emigration although average flow can drop to approximately 500 cfs by the end of June (Wade 2002). Release of this hatchery program is consistent in a timeframe with adequate flows to help emigration and before lower water conditions result in greater risk.

Dates of Releases: Steelhead can be released starting April 15, but staff has been implementing release dates after May 1st when operational and environmental conditions permit. Hatchery steelhead releases timed after these dates are consistent with providing a high level of protection to listed salmon from yearling hatchery programs and increase survival. Yearling programs close to release times are at the mercy of environmental conditions, and unforeseen problems such as high temperatures or unusual low water conditions could also require Region staff to consider early release.

Relative Body Size: Studies and opinions on size of predator/prey relationships vary greatly and although there is evidence that salmonids can prey upon fish up to 50% of their body length, most prey consumed is probably much smaller. Keeley and Grant (2001) suggest that the mean prey size for 100-200 mm fl salmonids is between 13-15% of predator body size. Salmonid predators were thought to be able to prey on fish up to approximately 1/3 of their length (USFWS 1994), although coho salmon have been observed to consume juvenile chinook salmon of up to 46% of their total length in aquarium environments (Pearsons et al. 1998). Artic char are well known as piscivorous predators, but recent studies suggest the maximum prey size is approximately 47% of their length (Finstad et al. 2002). The "33% of body length" criterion for evaluating the potential risk of predation in the natural environment has been used by NOAA Fisheries and the USFWS in a number of biological assessments and opinions (c.f., USFWS 1994; NMFS 2002). Although predation on larger Chinook juveniles may occur under some conditions, WDFW believes that a careful review of the Pearson and Fritts (1999) study supports the continued use of the "33% of body length criterion" for listed species until further data for this system can be collected.

Release Location and Release Type: The likelihood of predation may also be affected by the location and the type of release. The risk of predation may increase with the length of time fish co-mingle. In the freshwater environment, this is likely to be affected by distribution of the listed species in the watershed, the location of the release and the speed at which fish released from the program migrate. Steelhead released from hatcheries emigrated at rates of up to 20 Rm per day (Harza 1998).

We have provided in the next sections a summary of empirical information and theoretical analysis of competition and predation interactions that may be relevant to the Kalama hatchery summer steelhead program.

Potential Kalama summer steelhead predation and competition effects on listed salmonids: Proposed annual production goal is 30,000 actively migrating summer steelhead smolts released from Fallert Ck. that can begin April 15 of the year at 5.0 - 5.5 fpp (210 – 206 mm fl) although WDFW has been implementing a release date after May 1st. Fish are released directly from ponds to Fallert Creek which, joins the Kalama River at RKm 8.2. Due to size differences between yearling smolts and fingerlings, competition is probably low with first year chinook and steelhead with regards to food and spatial preference between species and size. Steelhead smolts can pose a predation risk to listed fish 70 mm fl and less. Impact to listed species is lessoned due to the downstream location of the Fallert Ck. Hatchery at Fallert Creek which is below much of the listed fish habitat. Below are some data available for chinook lengths from Lower Columbia streams:

- Average fork length by week from 26 sampling sites on the Kalama River in 1989 and 1990 by week indicate fish average 44 mm fl (April 25), 46 mm fl (May 3), 56 mm fl (May 11) and 62 mm fl (May 16), (Pettit WDFW 1990).
- Studies on Cedar Creek (Lewis River system) indicate that a majority of Chinook have emigrated quickly by April 1st, with fish remaining increasing in size from 40mm to over 70mm from April to mid May (Rawding 2004). It is unclear if the life history patterns described for Cedar Creek are typical of tule stocks from larger basins (Grays, Elochoman, Coweeman, Kalama, EF Lewis, and Washougal). Fork lengths on Chinook remaining past the first peak are approximately 50 mm fl between the weeks of April 12 and April 19 (2004), and can reach 55-60 mm fl from April 26 and May 3, 2004 (Figure 1).

Listed steelhead are in the system but a release date of May 1st, would result in hatchery plants vacating the system before peak emergences. Depending on available temperature units, eggs will hatch in 4-7 weeks with fry emergence approximately 2-3 weeks after hatching (LCSI Draft 1998). Wild summer run spawn timing is approximately one month earlier with the week of March 23 representing the halfway point of the summer spawn time from Feb 1st to May 1st (Table 2).

Table 4. Steelhead Spawn and Emergence Windows.

Race	Spawn Time	Peak Spawn Window	Incubation to Hatch	Swim-up Window	Swim-up @ 50% Date	Source
Winter	March – May	April 15 - 25th	May 13 – June 15	May 27- July 7	June 17	LCSI Draft 1998
Summer	February –April	March 20-30th.	April 14 – May 18	April 28 – June 2	May 15	Kalama River Research Report 2003

Listed Coho (Proposed):
Current lengths and data for proposed listed coho in the Kalama River basin is unknown. Depending on water temperatures, hatchery coho fry during the month of April can range from 42 – 40 mm fl and reach 51 mm fl by the end of May (LCR coho fry data 2001).

Indirect take from competition and predation is unknown.

Residualism: To maximize smolting characteristics and minimize residual steelhead, a number of rearing and program guidelines are followed:

- WDFW adheres to a combination of acclimation, volitional release strategies, active pond management, size, and release guidelines (Steelhead Guidelines, July 2001).
- Condition factors, including a lean .90-.99 K factor, and co-efficient of variation (CVs) on smolt fork lengths at release of less than 10% are steelhead rearing parameters.
- Steelhead release programs practice active pond management to remove fish less than 180 mm fl and greater than 250 mm fl on release (Steelhead Guidelines, July 2001).

Indirect take from residualism is unknown.

Migration Corridor/Ocean: It is unknown to what extent listed fish are available both behaviorally or spatially on the migration corridor. Once in the main stem, Witty et al. (1995) has concluded that predation by hatchery production on wild salmonids does not significantly impact naturally produced fish survival in the Columbia River migration corridor. Evidence in estuarine and nearshore environments indicate that diets are often dominated by invertebrates with Durkin (1982) reporting that diet of coho smolts (128-138 mm fl) in the Columbia River estuary was composed almost entirely of invertebrates without evidence of salmonids as prey (HSRG - Hatchery Reform 2004). There appear to be no studies demonstrating that large numbers of Columbia system smolts emigrating to the ocean affect the survival rates of juveniles in the ocean in part because of the dynamics of fish rearing conditions in the ocean. Indirect take in the migration corridor or ocean is unknown.

Monitoring:

Associated Monitoring Activities: - The following monitoring activities are conducted in the Lower Columbia Management Area (LCMA) for adult steelhead and salmon: redd surveys are conducted for winter steelhead in the SF Toutle, Coweeman, EF Lewis and Washougal rivers. Redd surveys are also conducted in the Cowlitz River for fall and spring chinook. Mark-recapture surveys provide data for summer steelhead populations in the Wind and Kalama rivers. Mark-recapture carcass surveys are conducted to estimate populations of chinook salmon in Grays, Elochoman, Coweeman, SF Toutle, Green, Kalama, NF Lewis, EF Lewis, rivers and Skamokawa, Mill, Abernathy, and Germany creeks and for all chum salmon populations. Snorkel surveys are conducted for summer steelhead in the EF Lewis, Washougal rivers. Trap Counts are conducted on the Cowlitz, NF Toutle, Kalama, and Wind rivers and on Cedar Creek a tributary of the NF Lewis River. Area-Under-the-Curve (AUC) surveys are conducted to collect population data for chum salmon in Grays River and Hardy and Hamilton Creeks. All sampling of carcasses and trapped fish include recovery of coded wide tagged (CWT) fish for hatchery or wild stock evaluation. Downstream migrant trapping occurs on the Cowlitz, Kalama, NF Lewis, and Wind rivers, Cedar Creek, and will expand to other basins as part of a salmonid life cycle monitoring program to estimate freshwater production and wild smolt to adult survival rates. Any take associated with monitoring activities is unknown but all follow scientific protocols designed to minimize impact.

Monitoring and Evaluation: For the Kalama wild steelhead research, up to 3200 smolts can be captured for research with up to 150 smolts taken. All others are released back to the river. In some years up to 5000 adults can be handled with 80 removed as broodstock. Another 40 (<1.0%) can be lost in handling. See also, Kalama River wild summer steelhead HGMP.

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. See Take Tables at end of document.

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.

Any additional mortality from this operation on a yearly basis would be communicated to WDFW Fish Program staff for additional guidance. For other listed species, if significant numbers of wild salmonids are observed impacted by this operation, then staff would inform the WDFW District Biologist, Fish Health Specialist or Area Habitat Biologist who, along with the Hatchery Complex Manager, would determine an appropriate plan and consult with NOAA Fisheries for adaptive management review and protocol.

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

In recent years essentially all wild steelhead attempting to enter the upper Kalama watershed are captured and handled over the course of normal hatchery operations and the associated research programs in place. Since both winter and summer-run steelhead are listed in the Kalama, the total take is thus the sum of the run sizes within a calendar year for each of the races, less fish that evade capture in the trap. See Kalama River wild steelhead HGMPs.

Section 3: Relationship of Program to Other Management Objectives

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.

For ESU-wide hatchery plans, the production of steelhead from Kalama River Hatcheries is consistent with:

- 1999 Biological Opinion on Artificial Propagation in the Columbia River Basin
- 1999 Review of Artificial Production of Anadromous and Resident Fish in the Columbia River Basin
- Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1994)
- The *U.S. v. Oregon* Columbia River Fish Management Plan
- NWPPC Fish and Wildlife Program

For statewide hatchery plan and policies, hatchery programs in the Columbia system adhere to a number of guidelines, policies and permit requirements in order to operate. These constraints are designed to limit adverse effects on cultured fish, wild fish and the environment that might result from hatchery practices. Following is a list of guidelines, policies and permit requirements that govern WDFW Columbia hatchery operations with which the production of steelhead from Elochoman River Hatchery is consistent with the following WDFW Policies*:*

Genetic Manual and Guidelines for Pacific Salmon Hatcheries in Washington. These guidelines define practices that promote maintenance of genetic variability in propagated salmon. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).

Spawning Guidelines for Washington Department of Fisheries Hatcheries. Assembled to complement the above genetics manual, these guidelines define spawning criteria to be use to maintain genetic variability within the hatchery populations. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 7, IHOT 1995).

Stock Transfer Guidelines. This document provides guidance in determining allowable stocks for release for each hatchery. It is designed to foster development of locally-adapted broodstock and to minimize changes in stock characteristics brought on by transfer of non-local salmonids (WDF 1991).

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* (Fish Policy Chapter 5, IHOT 1995).

WDFW Steelhead Rearing Guidelines. Details rearing guidelines and rearing parameters statewide (July 31, 2001).

National Pollutant Discharge Elimination System Permit Requirements This permit sets forth allowable discharge criteria for hatchery effluent and defines acceptable practices for hatchery operations to ensure that the quality of receiving waters and ecosystems associated with those waters are not impaired.

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

The program described in this HGMP is consistent with the following agreements and plans:

- The Columbia River Fish Management Plan
- U.S. vs. Oregon court decision
- Production Advisory Committee (PAC)
- Technical Advisory Committee (TAC)
- Integrated Hatchery Operations Team (IHOT) Operation Plan 1995 /Volume III.
- Pacific Northwest Fish Health Protection Committee (PNFHPC)
- In-River Agreements: State, Federal, and Tribal representatives
- Northwest Power Planning Council Sub Basin Plans
- Washington Department of Fish and Wildlife Wild Salmonid Policy
- The Columbia River Fish Management Plan

Also: The Clark Public Utility and the Department of Fish and Wildlife have a partnership with the Vancouver Hatchery, which provides rearing, and incubation for the Skamania Summer Steelhead program. The Vancouver Hatchery provides pathogen free water for IHN virus protection for Skamania Summer Steelhead during spring rearing activities.

3.3 Relationship to harvest objectives.

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

Steelhead from the Kalama River contribute to targeted sport fisheries in the river and perhaps some Columbia River mainstem fishing. Program is 100% mass marked (adipose fin-clipped) for the purpose of selective fisheries management. Selective fisheries were initiated for steelhead in the late 1980's in the lower Columbia River tributaries. This regulation requires the release of all wild steelhead. ESA limits fishery impact on wild winter steel steelhead at 2% per year. On the Kalama River harvest rates for hatchery fish are believed to range from 40% to 70% and averaged near 50%. Until wild steelhead populations have recovered, wild steelhead release regulations will be in effect with incidental mortality limited to less than 7% on wild stocks. The harvest rate of hatchery fish is expected to remain greater than 40% for most stocks.

Until wild steelhead populations have recovered, wild steelhead release regulations will be in effect with incidental mortality limited to less than 7% on wild stocks. In most populations it is estimated to be less than 3%. The harvest rate of hatchery fish is expected to remain greater than 40% for most stocks.

Return Year	Hatchery Harvest	Escapement	Combined
1990	2,510	1,034	3,544
1991	2,284	1,588	3,872
1992	4,040	4,905	8,945
1993	2,559	2,797	5,356
1994	1,488	1,741	3,229
1995	521	1,150	1,671
1996	1,012	2,395	3,407

1997	946	555	2,210
1998	363	187	1,285
1999	1,147	30	2,409
2000	2,320	52	3,254
2001	1,377	228	2,807
2002	2,657	852	10,470
Averages	1786	1347	4035

3.4 Relationship to habitat protection and recovery strategies.

Subbasin Planning and the Lower Columbia Fish Recovery Board (LCFRB)
Kalama River HGMP processes are designed to deal with existing hatchery programs and potential reforms to those programs. A regional sub-basin planning process (Draft Kalama River Subbasin Summary May 17, 2002 is a broad-scale initiative that will provide building blocks of recovery plans use by the Lower Columbia Fish Recovery Board (LCFRB) for listed fish and may well use HGMP alternative ideas on how to utilize hatchery programs to achieve objectives and harvest goals. In order to assess, identify and implement restoration, protection and recovery strategies, Region 5 staff is involved in fish and wildlife planning and technical assistance in concert through the LCFRB including the role of fish release programs originating from Kalama Complex. Staff is assessing the risks posed by the hatchery program using the Benefit-Risk Assessment Procedure (BRAP) in tandem with the LCFRB recovery plan.

Habitat Treatment and Protection
WDFW is presently conducting or has conducted habitat inventories within the Kalama River subbasin. Ecosystem Diagnosis and Treatment (EDT) compares habitat today to that of the basin in a historically unmodified state. It creates a model to predict fish population outcomes based on habitat modifications. WDFW is also conducting a Salmon Steelhead Habitat Inventory Assessment Program (SSHIAP), which documents barriers to fish passage. WDFW's habitat program issues hydraulic permits for construction or modifications to streams and wetlands. This provides habitat protection to riparian areas and actual watercourses within the watershed.

Limiting Factors Analysis
A WRIA 27 (Kalama, North Fork Lewis River, and East Fork Lewis River Salmon) habitat limiting factors report (LFA) has been completed by the Washington State Conservation Commission. Loss of channel diversity, increased sedimentation, reduced stream flows, habitat constriction due to effects of irrigation withdrawn, water temperature, and inundation and loss of spawning/rearing habitat through dam construction, and fragmentation of habitat all affect productivity of natural salmonid populations within the watershed. Reduced summer flows in recent years is likely the result of diminished glacial melt following the eruption of Mt. St. Helens.

3.5 Ecological interactions.

Below are discussions on both negative and positive impacts relative to the Kalama summer steelhead program and are taken from the Puget Sound listed and non-listed HGMP template (WDFW and NOAA 2003).

(1) Salmonid and non-salmonid fishes or species that could negatively impact the program: Kalama steelhead smolts can be preyed upon release thru the entire migration corridor from the Kalama river subbasin to the mainstem Columbia River and estuary. Northern pikeminnows and introduced spiny rays in the Columbia mainstem sloughs can predate on steelhead smolts as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons. Mammals that can take a heavy toll on migrating smolts (river otters), and returning adults include: harbor seals, sea lions 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 thru 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. See also Section 2.2.3 Predation and Competition.

3) Salmonid and non-salmonid fishes or other species that could positively impact the program. Multiple programs including fall chinook spring chinook, Type S and Type N and coho and steelhead programs are released from the Kalama system and limited natural production of chinook, coho, chum and steelhead occurs in this 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. Kalama steelhead smolts can be preyed upon through the entire migration corridor from the river subbasin to the mainstem Columbia River and estuary. Northern pikeminnows and introduced spiny rays in the Columbia mainstem sloughs can predate on steelhead smolts as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons. Mammals that benefit from migrating smolts (river otters), and returning adults include: harbor seals, sea lions and Orcas. While not always desired from a production standpoint, these hatchery fish provide an additional food source to natural predators that might otherwise consume listed fish and may overwhelm established predators providing a beneficial, protective effect to co-occurring wild fish. The nutrient enhancement from spawned adults from salmonid and non-salmonid species may contribute nutrients that increase overall productivity in the watershed, reducing inter-species interactions. Many watersheds in the Pacific Northwest appear to be nutrient-limited (Gregory et al. 1987; Kline et al. 1997) and salmonid carcasses can be an important source of marine derived nutrients (Levy 1997). Carcasses from returning adult salmonids have been found to elevate stream productivity through several pathways, including: 1) the releases of nutrients from decaying carcasses has been observed to stimulate primary productivity (Wipfli et al. 1998); 2) the decaying carcasses

have been found to enrich the food base of aquatic invertebrates (Mathisen et al. 1988); and 3) juvenile salmonids have been observed to feed directly on the carcasses (Bilby et al. 1996). Addition of nutrients has been observed to increase the production of salmonids (Slaney and Ward 1993; Slaney et al. 2003; Ward et al. 2003). *Saprolegniasis* occurrences in young hatchery fish have been observed in greater frequency on Mitchell Act stations and in some cases, circumstantial evidence suggests more outbreaks of gill and tail fungus are the result of nutrient enhancement efforts. Staff is continuing to monitor observations or occurrences of this possibility.

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.

At Fallert Creek, water can be gravity fed from the creek intake providing up to 10,000 gpm depending on weather and stream conditions. Pumps need to used when dewatering becomes a concern late summer and early fall and the river intake is located adjacent to the hatchery with a four chambered pump system which can provide up to 5,000 gpm. Between the facilities, a total of 15,112 gpm is used (Montgomery Watson 1997).

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.

Potential Hazard	Risk Aversion Measure
Hatchery water withdrawal	Water rights total 26,031gpm from October to June (Montgomery Watson 1997) and are formalized thru trust water right #S2-24832 from the Department of Ecology. Monitoring and measurement of water usage is reported in monthly NPDES reports (see below).
Intake/Screening Compliance	At Fallert Creek hatchery, both intake and screen criteria are not in compliance as WDFW has determined that fish passage upstream is necessary. From the assessment, significant changes are needed, WDFW has been requesting funding for future scoping, design, and construction work of a new intake system (The Mitchell Act Intake and Screening Assessment 2002). The Kalama Falls intake was rebuilt in 2001 and is in compliance.
Hatchery effluent discharges. (Clean Water Act)	This facility operates under the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit which conducts effluent monitoring and reporting and operates within the limitations established in its permit administered by the Washington Department of Ecology (DOE). WAG 13-1010. Monthly and annual reports on water quality sampling, use of chemicals at this facility, compliance records are available from DOE. Adherence with the NPDES permit will likely lead to no adverse effects on water quality from the program on listed fish. Discharges from the cleaning treatment system are monitored as follows: *Total Suspended Solids (TSS)*C1 to 2 times per month on composite effluent, maximum effluent and influent samples. *Settleable Solids (SS)*C1 to 2 times per week on effluent and influent samples. *In-hatchery Water Temperature* - daily maximum and minimum readings.

Section 5. Facilities

5.1 Broodstock collection facilities (or methods).

See Skamania Summer Steelhead HGMP.

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

A 1900 gallon tanker from Skamania Hatchery transfers fish (10 fpp) in late fall, at 5% (Sodium Chloride) salinity to Fallert Creek.

.3 Broodstock holding and spawning facilities.

See Skamania Summer Steelhead HGMP.

5.4 Incubation facilities.

See Skamania Summer Steelhead HGMP.

5.5 Rearing facilities.

A portion of these receptacles are used for this program.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Flow Index	Max. Density Index
60	Shallow Troughs (Post emergence Rearing)- Skamania Hatchery	60	nya	nya	nya	10	1.6	0.3
6	Fiberglass - Skamania Hatchery	90	15	3.0	2.0	40	1.6	0.3
10	Concrete Raceways- Skamania Hatchery	210	35	4.0	1.5	75	1.6	0.3
32	Concrete Raceways- Skamania Hatchery	1800	80	10	2.25	300	1.6	0.3
5	Concrete Standard Raceways- Fallert Creek Hatchery	4800	80	20	3.0	500	nya	0.20

5.6 Acclimation/release facilities.

Fallert Creek Hatchery rears fish from late fall thru April release in standard raceways 80x20x4 ft. Fish are reared, acclimated, and released as subyearling smolts directly from the rearing/acclimation units. Production from occurs with a mixture of Kalama River water and Fallert Creek water to imprint and acclimate fish.

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

Low flow and high ambient temperatures can cause stress and have led to low dissolved oxygen levels at Fallert Creek, significant direct loss has not been common, but indirect problems in the future can be the result of these events. In some years (2002) programs such as the fall Chinook 2.5 million release was impacted by D.O. problems which forced a reduction in feed regime and ultimate release of program short (20%) of size (fpp).

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.

No listed fish are concerned, but staff is available 24/7 ready to react to system failure and we have emergency procedures and plans in place. All systems are alarmed to alert us of failure.

Potential Hazard	Risk Aversion Measure
Water Loss	The facility is sited so as to minimize the risk of catastrophic fish loss from flooding and set up with low water alarm probes in strategic locations to prevent loss due to loss of water. Alarm systems are monitored 24/7 with staff available on station 24 daily to respond to problems.
Disease Transmission	IHOT fish health guidelines are followed. WDFW fish health specialists conduct inspections monthly and problems are managed promptly to limit mortality and reduce possible disease transmission. As for the threat of a virus outbreak, we have very strict disinfection procedures and comprehensive lab analysis of all egg takes for culling, if needed.

Section 6. Broodstock Origin and Identity

6.1 Source.

See Skamania Hatchery Summer Steelhead HGMP.

6.2.1 History.

The Skamania Hatchery Summer Steelhead stock was derived from wild fish taken from the Washougal River (beginning in 1956, with production from Skamania from 1959 until present) with a minor contribution from the Klickitat River (Crawford 1979). For decades the Skamania Hatchery Summer Steelhead broodstock has been obtained directly from adults returning to the hatchery. The broodstock chosen represents natural populations native or adapted to the watersheds in which hatchery fish will be released. Skamania is the only hatchery summer steelhead stock widely used in western Washington. See also Skamania Summer Steelhead HGMP.

6.2.2 Annual size.

Broodstock needs have been consistent at approximately 600 to 800 adult fish returning to the hatchery. The average hatchery return over the past 9 years has been 1653 fish with the highest year in 1992 (5173 fish) and the lowest year being 1999 with an estimated 600 fish. The sex ratio for Skamania Summer Steelhead is typically 45% males and 55% females. A comprehensive view of adult fish returns is found in the " Preliminary Stock Status For Steelhead in the Lower Columbia River, Washington, November 1997, WDFW".

The intent of the adult collection procedures at Skamania Hatchery is to collect enough adults to maintain the hatchery production program. Hatchery fish enter the sub-basin from April through September with a peak in June/July. Adults captured are spawned at the hatchery while some portion of the run may pass the fishway and escape to the upper portion of the North Fork Washougal River where a considerable sport harvest occurs. Wild fish (with adipose fin) that become trapped are transported up-stream or directly released for up-stream passage. See also Skamania or Lewis River Summer Steelhead HGMPs.

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

Natural origin fish are not integrated within the broodstock program.

6.2.4 Genetic or ecological differences.

Skamania Summer Steelhead pool with wild summer steelhead from the Lower Columbia River (Phelps et. al. 1994, Leider et al. 1996 and Busby et al. 1997). The difference in spawn timing (3 months earlier for Skamania hatchery fish), poor reproductive success for these fish in the wild (Hulett et al. 1998) and spatial separation at spawning have helped to maintain genetic differences between hatchery and wild fish. Fish are released as age-1+ smolts whereas wild steelhead are predominantly age-2+ smolts. Outmigration timing for both life history types is similar but is slightly earlier for hatchery component (Fuss et. al. 1999).

6.2.5 Reasons for choosing.

For decades the Skamania Hatchery Summer Steelhead broodstock has been obtained directly from adults returning to the hatchery. There has been a long history of adaptation of the stock to Skamania facility contributing to the success of the summer steelhead program. Skamania stock has been the source of nearly all the hatchery summer steelhead smolts that WDFW releases in the Lower Columbia River region with the exception of Cowlitz and Lewis rivers (BO for CRFD funded facilities, March 1999).

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.

- Only hatchery stock is used.
- Timing is separated from natural steelhead.
- Holding pond procedures follow IHOT guidelines.
- Other listed fish, if identified, will be released immediately if encountered during the broodstock collection process.

Section 7. Broodstock Collection

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

Adults not handled at this station for broodstock collection. See also Skamania or Lewis River Summer Steelhead HGMPs. Adults that show up are for harvest and recycled back through the harvest areas. Eventually, repeat recycled adults can be taken to a landlocked lake.

7.2 Collection or sampling design

Adults not handled at this station. See also Skamania or Lewis River Summer Steelhead HGMPs.

7.3 Identity.

Adults not handled at this station. See also Skamania or Lewis River Summer Steelhead HGMPs.

7.4 Proposed number to be collected: Adults not handled at this station. See also Skamania or Lewis River Summer Steelhead HGMPs.

7.4.1 Program goal (assuming 1:1 sex ratio for adults):
Adults not handled at this station. See also Skamania or Lewis River Summer Steelhead HGMPs.

7.4.2 Broodstock collection levels for the last twelve years (e.g. 1990-2001), or for most recent years available. See also Skamania or Lewis River Summer Steelhead HGMPs. See also Skamania Summer Steelhead HGMP.

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

Adults not handled at this station. See also Skamania or Lewis River Summer Steelhead HGMPs.

7.6 Fish transportation and holding methods.

Adults not transported at this station. See also Skamania or Lewis River Summer Steelhead HGMPs.

7.7 Describe fish health maintenance and sanitation procedures applied.

Adults not handled at this station. See also Skamania or Lewis River Summer Steelhead HGMPs.

7.8 Disposition of carcasses.

Carcasses not handled for this program. See also Skamania or Lewis River Summer Steelhead 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.

- Only hatchery stock is used.
- Timing is separated from natural steelhead.
- Holding pond procedures follow IHOT guidelines.
- Other listed fish, if identified, will be released immediately if encountered during the broodstock collection process.

Section 8. Mating

8.1 Selection method.

See Skamania or Lewis River summer steelhead HGMPs.

8.2 Males.

See also Skamania Summer Steelhead HGMP.

8.3 Fertilization.

See also Skamania Summer Steelhead HGMP.

8.4 Cryopreserved gametes.

Not applicable.

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.

Listed fish are not used in the mating scheme.

Section 9. Incubation and Rearing.

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

Pats data is from Washougal Complex only. See also Skamania Summer Steelhead HGMP.

Year	Egg Take	Green-Eyed Survival (%)	Eyed-Ponding Survival (%)	Egg Survival Perfor-mance Std.	Fry-fingerling Survival (%)	Rearing Survival Perfor-mance Std.	Fingerling-Smolt Survival (%)
1995	1870326	87.6	98.6	90	96.6	90	93.6
1996	1928449	93.1	96.0	90	99.0	90	94.0
1997	1034175	92.3	94.5	90	93.5	90	95.8
1998	765494	86.9	97.4	90	95.7	90	96.3
1999	655582	83.7	98.0	90	94.0	90	98.3
2000	673409	90.0	97.0	90	99.0	90	94.9
2001	537117	90.5	98.0	90	98.6	90	84.0

9.1.2 Cause for, and disposition of surplus egg takes.

See also Skamania Summer Steelhead HGMP.

9.1.3 Loading densities applied during incubation.

See Skamania Summer Steelhead HGMP.

9.1.4 Incubation conditions.

The program is not incubated at Fallert Creek.

9.1.5 Ponding.

See Skamania Summer Steelhead HGMP.

9.1.6 Fish health maintenance and monitoring.

Staff conducts daily inspection, visual monitoring and sampling from 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.

See Skamania Summer Steelhead HGMP.

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 (1990-2001), or for years dependable data are available.

Table below is from rearing up to the transfer of fish to Kalama River. Survival of fish for final rearing at Fallert has been good, for instance 0.42% mortality for rearing Sept-thru April 2002.

Year	Egg Take	Green-Eyed Survival (%)	Eyed-Ponding Survival (%)	Egg Survival Perfor-mance Std.	Fry-fingerling Survival (%)	Rearing Survival Perfor-mance Std.	Fingerling-Smolt Survival (%)
1995	1870326	87.6	98.6	90	96.6	90	93.6
1996	1928449	93.1	96.0	90	99.0	90	94.0
1997	1034175	92.3	94.5	90	93.5	90	95.8
1998	765494	86.9	97.4	90	95.7	90	96.3
1999	655582	83.7	98.0	90	94.0	90	98.3
2000	673409	90.0	97.0	90	99.0	90	94.9
2001	537117	90.5	98.0	90	98.6	90	84.0

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

The juvenile rearing density and loading guidelines used at the facility are based on: standardized agency guidelines, life-stage specific survival studies conducted at other facilities and staff experience (e.g. trial and error). IHOT standards are followed for: water quality , alarm systems , predator control measures to provide the necessary security for the cultured stock , loading and density. In all facilities within Kalama Complex, densities are kept at or below 3.3 lbs /gpm and 0.5 lbs /cu ft. before the last loading reduction in the fall of the year. 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).

9.2.3 Fish rearing conditions.

At Fallert Creek, fish are reared in standard ponds. Temperature, dissolved oxygen and pond turn over rate are monitored. IHOT standards are followed for: water quality, alarm systems, predator control measures (netting) to provide the necessary security for the cultured stock, loading and density. Settleable solids, unused feed and feces are removed regularly to ensure proper cleanliness of rearing containers. Rearing units are cleaned at least one time per week more if needed, using vacuum system.

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.

Rearing Period	Length (mm)	Weight (fpp)	Condition Factor	Growth Rate
April	36	1000	nya	0.54
May	46	400	nya	0.60
June	64	175	nya	0.56
July	80	90	nya	0.48
August	101	45	nya	0.50
September	139	17	nya	0.63
October	153	13	nya	0.23
November	167	10	nya	0.23
December	173	9.0	nya	0.10
January	180	8.0	nya	0.11
February	188	7.0	nya	0.12
March	198	6.0	nya	0.14

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

Same, see HGMP section 9.2.4 above.

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)	Lbs. Fed Per gpm of Inflow	Food Conversion During Period
March-July	BioDiet	8	3.0-4.0	0.1	1.2
August-September	Moore Clark Nutra	6	2.0-2.5	nya	0.80
October-December	Moore Clark Nutra	Demand	1.0-1.5	nya	1.0
December-April	Trout AB	U	0.5	U	U

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 Kalama Complex monthly and checks both healthy and if present symptomatic fish. Based on pathological or visual signs 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. At Fallert Ck., fish health has been good without disease treatments. Any pond 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. Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

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

The migratory state of the release population is noticeable by fish behavior. Aggressive screen and intake crowding, swarming against sloped pond sides, leaner condition factors, a more silvery physical appearance and loose scales during feeding events are signs of smolt development that can be observed by staff. ATPase activity is not measured.

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

None.

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 fish are used in this propagation.

Section 10. Release

10.1 Proposed fish release levels.

Summer steelhead hatchery stock transferred from Skamania or Merwin release has been 30,000 at 5.0-5.5 fpp.

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

Fish are released from raceways at Fallert Creek located at RKm 8.2 directly at the confluence of Fallert Creek with the Kalama River.

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

In 2001 release was 29,586 fish at 6.2 fpp, in 2002 release was 29,874 fish at 5.1 fpp and in 2003 release was 29,625 at 6.0 fpp.

10.4 Actual dates of release and description of release protocols.

Smolts are direct released/forced from the Fallert Creek raceway rearing units into Fallert Creek/Kalama River during the April 15-May 15 period at 5 fpp. From 2001 – 2003 release dates were: April 15, April 16 and April 16.

10.5 Fish transportation procedures, if applicable.

Transportation not needed as fish are released on-site from Kalama No. 2.

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

Fish are reared from early winter thru mid-spring at Fallert Ck. Acclimation, imprinting and smoltification occurs on a combination of Kalama River and Fallert Creek waters.

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

Fish are for selective fishery with 100% mass mark (AD Clip) done at Skamania hatchery before transfer to Kalama No. 2.

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

Transfer goal from Skamania to Fallert Ck. is set number with actual numbers plus/minus 5% guideline.

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 examine, whenever abnormal behavior or mortality is observed, staff also conducts 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 and IHOT guidelines.

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

In the event of a water system failure, screens would be pulled to allow fish to exit the ponds or in some cases they can be transferred into other rearing vessels to prevent an emergency release. WDFW also has emergency response procedures for providing back-up pumps, transport trucks,

etc. in cases of emergency. In cases of severe flooding the screens are not pulled because flood waters rise to the point where they breach the ponds. Past experience has shown that the fish tend to lay on the bottom of the pond during flooding events and only those that are inadvertently swept out are able to leave. Every effort will be made to avoid pre-programmed releases including transfer to alternate facilities. Emergency releases, if necessary and authorized, would be managed by removal of outlet screens and pull sumps of the rearing units. If possible, staff would set up portable pumps to use river water to flush the fish.

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.

- Steelhead Rearing Guidelines target release sizes, condition factors and coefficient of variation (CV) that result in actively migrating smolts that vacate the system and limit freshwater interactions with listed species.
- A later release date is currently being implemented (May 1st on) to allow listed chinook to grow to a size (early May) that will help reduce predation opportunities, and be in advance of winter and summer steelhead fry emergence and after peak chum emergence.
- Release is from a location downstream of much of the habitat of listed chinook and steelhead.
- All program fish are mass marked for easy identification. Returning hatchery fish are under heavy selective harvest and are identified by adipose fin-clip. Recycling downstream for sport harvest opportunity eliminates as many fish as possible removing potential spawners. Surplus adults not harvested out of the system are taken to landlocked lakes for additional harvest and removal from spawning potential.
- Broodstock collection at Skamania separates timing of earlier hatchery fish from later wild spawners to minimize overlap of spawning potential.
- The current program release of 30,000 is a 63% reduction from the average releases the last twelve years (WDFW Historical Database Files).
- WDFW proposes to continue monitoring, research and reporting of hatchery smolt migration performance behavior, and intra and interspecific interactions with wild fish to assess, and adjust if necessary, hatchery production and release strategies to minimize effects on wild fish.
- WDFW fish health and operational concerns for Kalama Hatchery programs are communicated to Region 5 staff for risk management or needed treatment. See also section 9.7.

Section 11. Monitoring and Evaluation of Performance Indicators

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

Continue to calculate annual fisheries contribution rates based on coded-wire-tag recoveries in regional commercial and sport fisheries. Continue use of mass marked (ad clip) and coded-wire-tagged groups as effective management and research tools. Ongoing research by the Kalama Research Station may provide applicable methods for management of this steelhead program.

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

With the loss of Mitchell Act funding, staffing and logistical support may be lost to continue the monitoring and evaluation of this and other programs on the Columbia River. Current Fish program staff is available to complete monitoring and evaluation baseline Lower Columbia system needs while research is on-going for coho interaction in the Lewis River.

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. Most trap mortalities are the result of extreme environmental conditions that flood traps or equipment failure. WDFW will take precautions to make sure the equipment is properly functioning during the season. If environmental conditions are forecast that will cause high mortality then traps will be removed or opened up to allow unobstructed passage without mortality. Any take associated with monitoring activities is unknown but all follow scientific protocols designed to minimize impact.

Section 12. Research

12.1 Objective or purpose.

Ongoing research on the Kalama River will be used to evaluate steelhead programs in the Columbia system. The objectives of this work are to: 1) design and implement a wild broodstock hatchery program, 2) assess the reproductive success of hatchery fish from wild broodstock relative to that of wild fish, 3) measure interbreeding between wild fish and hatchery fish from wild broodstock and its effect on productivity of the naturally spawning population, and 4) assess the efficacy of wild broodstock hatchery programs in achieving natural production and other fishery management objectives including containment of risks to wild stocks. A thorough treatment of goals and objectives of the program as well as justification for and benefits of the work in the Kalama Basin is provided in Sharpe et al. (2000).

12.2 Cooperating and funding agencies. NA

12.3 Principle investigator or project supervisor and staff.

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

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

12.6 Dates or time periods in which research activity occurs.

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

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

12.10 Alternative methods to achieve project objects.

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

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.

Section 13. Attachments and Citations

13.1 Attachments and Citations

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Section 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

14.1 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:_____

Take Table 1. Estimated listed salmonid take levels by hatchery activity.

Spring Chinook

ESU/Population	Lower Columbia River Spring Chinook
Activity	Kalama River Hatchery Winter Steelhead
Location of hatchery activity	Kalama Falls Hatchery
Dates of activity	November - February
Hatchery Program Operator	WDFW

Type of Take	Annual Take of Listed Fish by life Stage (number of fish)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass (a)	nya	nya	nya	nya
Collect for transport (b)	nya	nya	nya	nya
Capture, handle, and release (c)	nya	nya	0*	nya
Capture, handle, tag/mark/tissue sample, and release (d)	nya	nya	nya	nya
Removal (e.g., broodstock (e)	nya	nya		nya
Intentional lethal take (f)	nya	nya	Unk	nya
Unintentional lethal take (g)	nya	nya	nya	nya
Other take (specify) (h)	nya	nya	nya	nya

0* Spring Chinook program is over by this time.
a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

Take Table 2. Estimated listed salmonid take levels by hatchery activity.

Fall Chinook

ESU/Population	Lower Columbia River Fall Chinook
Activity	Kalama River Hatchery Winter Steelhead
Location of hatchery activity	Kalama Falls Hatchery
Dates of activity	November - February
Hatchery Program Operator	WDFW

Type of Take	Annual Take of Listed Fish by life Stage (number of fish)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass (a)	nya	nya	nya	nya
Collect for transport (b)	nya	nya	nya	nya
Capture, handle, and release (c)	nya	nya	0	nya
Capture, handle, tag/mark/tissue sample, and release (d)	nya	nya	nya	nya
Removal (e.g., broodstock (e)	nya	nya	nya	nya
Intentional lethal take (f)	nya	nya	nya	nya
Unintentional lethal take (g)	nya	nya	nya	nya
Other take (specify) (h)	nya	nya	nya	nya

0* Spring Chinook program is over by this time.

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

Take Table 3. Estimated listed salmonid take levels by hatchery activity.

Summer Steelhead

ESU/Population	Lower Columbia River Summer Steelhead
Activity	Kalama River Hatchery Winter Steelhead
Location of hatchery activity	Kalama Falls Hatchery
Dates of activity	November - February
Hatchery Program Operator	WDFW

Type of Take	Annual Take of Listed Fish by life Stage (number of fish)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass (a)	nya	nya	nya	nya
Collect for transport (b)	nya	nya	nya	nya
Capture, handle, and release (c)	nya	nya	0*	nya
Capture, handle, tag/mark/tissue sample, and release (d)	nya	nya	nya	nya
Removal (e.g., broodstock (e)	nya	nya	nya	nya
Intentional lethal take (f)	nya	nya	nya	nya
Unintentional lethal take (g)	nya	nya	nya	nya
Other take (specify) (h)	nya	nya	nya	nya

0* There is a take for listed steelhead associated with holding summer steelhead for spawning (See Kalama Wild Winter STHD HGMP). Hatchery winter run are removed separate of this operation.

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.

b. Take associated with weir or trapping operations where listed fish are captured and transported for release.

c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.

d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.

e. Listed fish removed from the wild and collected for use as broodstock.

f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.

g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.

h. Other takes not identified above as a category

Take Table 4. Estimated listed salmonid take levels by hatchery activity.

Winter Steelhead

ESU/Population	Lower Columbia River Winter Steelhead
Activity	Kalama River Hatchery Winter Steelhead
Location of hatchery activity	Kalama Falls Hatchery
Dates of activity	November –February.
Hatchery Program Operator	WDFW

Type of Take	Annual Take of Listed Fish by life Stage (number of fish)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass (a)	nya	nya	nya	nya
Collect for transport (b)	nya	nya	nya	nya
Capture, handle, and release (c)	nya	nya	0*	nya
Capture, handle, tag/mark/tissue sample, and release (d)	nya	nya	nya	nya
Removal (e.g., broodstock (e)	nya	nya	nya	nya
Intentional lethal take (f)	nya	nya	nya	nya
Unintentional lethal take (g)	nya	nya	nya	nya
Other take (specify) (h)	nya	nya	nya	nya

0* There is a take for listed steelhead associated with holding summer steelhead for spawning (See Kalama Wild Winter STHD HGMP). Hatchery winter run are removed separate of this operation.

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.

b. Take associated with weir or trapping operations where listed fish are captured and transported for release.

c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.

d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.

e. Listed fish removed from the wild and collected for use as broodstock.

f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.

g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.

h. Other takes not identified above as a category

Take Table 5. Estimated listed salmonid take levels by hatchery activity.

Coho (Proposed)

ESU/Population	Lower Columbia River Coho
Activity	Kalama River Hatchery Winter Steelhead
Location of hatchery activity	Kalama Falls Hatchery
Dates of activity	November - February
Hatchery Program Operator	WDFW

Type of Take	Annual Take of Listed Fish by life Stage (number of fish)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass (a)	nya	nya	nya	nya
Collect for transport (b)	nya	nya	nya	nya
Capture, handle, and release (c)	nya	nya	0*	nya
Capture, handle, tag/mark/tissue sample, and release (d)	nya	nya	nya	nya
Removal (e.g., broodstock (e)	nya	nya	nya	nya
Intentional lethal take (f)	nya	nya	nya	nya
Unintentional lethal take (f)	nya	nya	nya	nya
Other take (specify) (h)	nya	nya	nya	nya

0* Hatchery summer run are removed separate of any coho operation.

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.

b. Take associated with weir or trapping operations where listed fish are captured and transported for release.

c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.

d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.

e. Listed fish removed from the wild and collected for use as broodstock.

f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.

g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.

h. Other takes not identified above as a category