HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	Washougal River Fall Chinook
Species or Hatchery Stock	Chinook Salmon *(Oncorhynchus tshawytscha)*
Agency/Operator	Washington Department Fish and Wildlife
Watershed and Region	Washougal/Lower Columbia Province
Date Submitted	nya
Date Last Updated	August 13, 2004

Section 1: General Program Description

1.1 Name of hatchery or program.

Washougal River Fall Chinook

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

Washougal River Fall Chinook *(Oncorhynchus tshawytscha*)

ESA Status: Threatened

1.3 Responsible organization and individuals.

Name (and title):	Richard Johnson
	Washougal-Skamania Hatcheries Complex Manager
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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	5.0
Annual operating cost (dollars)	$587,000

The above information for full-time equivalent staff and annual operating cost applies cumulatively to Washougal River Hatchery Anadromous Fish Programs and cannot be broken out specifically by program.

1.5 Location(s) of hatchery and associated facilities.

Broodstock source	Washougal Hatchery Tule Fall Chinook
Broodstock collection location (stream, RKm, subbasin)	Washougal Hatchery/Washougal River/RKm 32.2/Washougal
Adult holding location (stream, RKm, subbasin)	Washougal Hatchery/Washougal River/RKm 32.2/Washougal
Spawning location (stream, RKm, subbasin)	Washougal Hatchery/Washougal River/RKm 32.2/Washougal
Incubation location (facility name, stream, RKm, subbasin)	Washougal Hatchery/Washougal River/RKm 32.2/Washougal
Rearing location (facility name, stream, RKm, subbasin)	Washougal Hatchery/Washougal River/RKm 32.2/Washougal

1.6 Type of program.

Integrated Harvest - (Lower Columbia River)
The proposed integrated strategy for this program is based on WDFW's assessment of the genetic characteristics of the hatchery and local natural population, the current and anticipated productivity of the habitat used by the populations, the potential for successfully implementing an isolated program, and NMFS' proposed listing determination (69 FR 33102; 6/14/2004). Modification of the proposed strategy may occur based upon NMFS' final listing determination and as additional information are collected and analyzed.

Currently, fall chinook programs in the Lower Columbia River ESU are not mass marked so a level of integration is unknown. WDFW has asked for federal funds to implement mass marking of federally funded Mitchell Act fall chinook. The FFY 05 request is for funds to purchase mass marking trailers. The FFY 06 request will be for operating funds. Upon successful receipt of this funding, marking of brood year 2005 fall chinook would begin in the spring of 2006.

1.7 Purpose (Goal) of program.

- Rear and release 4,000,000 chinook sub-yearlings to the Washougal River system.
- The purpose is to mitigate for activities within the Columbia River Basin that have decreased salmonid populations.
- The primary goal of WDFW is to operate fisheries and hatcheries consistent with the recovery of fall chinook salmon in the Washougal River and to provide harvest opportunity consistent with the recovery of ESA listed populations and/or use hatcheries to reduce extinction risk or assist in recovery of listed populations. The major hatchery issues are: 1) to maintain the genetic diversity of hatchery and wild fall chinook in the Washougal River, and ensure the reproductive success of wild fall chinook meets or exceeds recovery needs, 2) minimize the ecological interactions of hatchery fall chinook on naturally produced salmon and steelhead, and minimize the mortality of naturally produced juvenile and adult salmon and steelhead due to facility operations. Guidelines for this type of program generally include the following: 1) incorporate wild fish annually into the broodstock; and that out of basin transfers into the hatchery will not occur except in extreme situations and only after consultation with the Regional Fish Program Manager; 2) to maintain similar genetic and biological characteristics between hatchery and wild populations including size, age, size and age at maturity, age at ocean

entry, fecundity, sex ratio, run timing, and spawning time; 3) limiting the proportion of hatchery spawners by managing for intense selective fisheries, and maintaining high trapping efficiencies at hatcheries and adult traps that remove hatchery fish prior to spawning; 4) use hatchery management practices, acclimation, timing, and lower river releases to limit competition and predation that can occur from hatchery releases; and 5) follow (IHOT 1995) guidelines to limit disease risks from hatchery salmon and steelhead (FMEP 2002).

1.8 Justification for the program.

- Legal justification includes: Mitchell Act, Pacific Northwest Electric Power Planning and Conservation Act, and U.S. v Oregon court agreements.
- WDFW protects listed fish and provides harvest opportunity on Washougal River programs through the Fish Management and Evaluation Plan (FMEP). The objectives of the WDFW's FMEP are based on the WDFW Wild Salmonid Policy (1997). 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. 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 Washougal fall chinook program, the following Risk Aversion are included in this HGMP:

Table 1. Summary of risk aversion measures for the Washougal Fall chinook program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.2	Water rights are formalized thru trust water right #S2-25274 from the Department of Ecology. Monitoring and measurement of water usage is reported in monthly NPDES reports. See also section 4.2. Monitoring and measurement of water usage is reported in monthly NPDES reports (see below).
Intake Screening	4.2	WDFW has requested funding for future scoping, design, and construction work of a new river intake system to meet NOAA compliance (Mitchell Act Intake and Screening Assessment 2002). See also section 4.2.
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 13-1044. See also section 4.2.
Broodstock Collection & Adult Passage	7.9	Listed cannot be identified without mass marking. Broodstock collection and sorting procedures can quickly identify listed steelhead if encountered and are released per protocol to minimize impact as determined by Region 5 staff.
Disease Transmission	7.9, 10.11	*Fish Health Policy in the Columbia Basin*. Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).
Competition & Predation	2.2.3, 10.11	Current risk aversions and future considerations are being reviewed and evaluated for further minimizing impacts to listed fish. See also those sections.

1.9 List of program "Performance Standards".

See table in Section 1.10.

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

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 to a meaningful harvest for sport, tribal and commercial fisheries. Achieve a 10-year average of .277% smolt-to-adult survival (range .0492% - .2964%) that includes harvest plus escapement.	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 500 adults are collected throughout the spawning run in proportion to timing, age and sex composition of return	Annual run timing, age and sex composition and return timing data are collected. Adhere to WDFW spawning guidelines. (WDFW 1983)
Region-wide, groups are marked in a manner consistent with information needs and protocols to estimate impacts to natural and hatchery origin fish	Use Ad+CWT index (90,000/4.5%) for evaluation purposes	Returning fish are sampled throughout their return for length, sex, mark and
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 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 (65 –50 fish/lb) and released from the hatchery at a time that fosters rapid migration downstream.	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.	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).

WDFW has established an egg take goal of 4.7 million eggs in the Future Brood Document (FBD). To meet this goal, a total of 1045 females and 1045 males need to be collected annually, based on an average fecundity of 5000 eggs/female and pre-spawning mortality of 10%. A pre-season meeting between Hatchery and Fish programs will occur in June/July to review past hatchery operations, natural escapement, and develop a plan for weir and hatchery operations during the upcoming fall season. Since run size predictions are not always accurate and run timing varies annually, programs must maintain flexibility to meet our goals of ensuring natural and hatchery numerical escapement objectives as well as selection for run timing, spawning time, and size.

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
Fingerlings	3500000	65.0	June	Washougal River	27.0	Washougal	Columbia
Fingerlings	50000	50.0	July	Washougal River	27.0	Washougal	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.

Brood Year	SAR	Return Year	Hatchery Escapement	Total Catch (all ages)
1990	0.2339%	1990	4814	
1991	0.0992%	1991	3877	
1992	0.2964%	1992	4840	296
1993	0.2951%	1993	3174	1076
1994	0.0467%	1994	4593	2039
1995	0.1683%	1995	7421	3001
1996	0.0746%	1996	10180	3942
1997	0.0492%	1997	6121	1277
1998	0.0818%	1998	3768	1851
1999	Na	1999	1598	4557
2000	Na	2000	1969	1551
2001	Na	2001	7324	8332
2002	Na	2002	7549	
Average	**0.2270%**	2003		

Data Sources – Regional Mark Information System (RMIS)/Pacific States Fishery Commission/WDFW Hatchery Data files.

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

The first year of operation for this hatchery was 1958.

1.14 Expected duration of program.

The program is on going with no planned termination.

1.15 Watersheds targeted by program.

Washougal/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:

Fall Chinook in the Washougal River are collected at a weir at the Washougal Hatchery (Rm 19.7). Hatchery fall chinook are not mass marked and the proportion of hatchery and wild fish in the broodstock is unknown. The hatchery is located above a barrier falls that historically limited the passage of fall chinook. Hatcheries can be managed for recovery and/or harvest benefits. In addition, returning hatchery carcasses can be used for nutrient enhancement. The nutrients can have positive benefits on all listed stocks because they can increase a watersheds juvenile salmonid productivity and capacity.

1.16.2 Potential Alternatives:

Develop broodstock collection and juvenile release facility at Salmon Falls Fishway. A trap at Salmon Falls would facilitate the change to an integrated program for all hatchery steelhead and salmon populations in the watershed. This would allow WDFW to switch to native steelhead broodstocks and allow for the broodstock collection needs in chinook and coho programs. This

would increase natural spawning by chinook in areas where they historically existed. A trap would create a wild steelhead sanctuary where no hatchery produced fish would be allowed to enter, thereby preserving their genetic integrity. Inter and intra species competition, disease transfer, residualism, and crossbreeding, would be reduced or eliminated.

Modify release time or location, and/or reduce the size of the program. The primary ecological risks include competition, predation, and disease transfer between hatchery fall chinook and juvenile steelhead, cutthroat, coho, chum, and fall chinook. Data from other chinook populations suggests that wild juvenile fall chinook salmon migration peaks in February or March and continues through July. WDFW hatchery fall chinook salmon release in July is toward the tail end of the wild migration.

Move peak run timing back to mid/late October to reduce snagging, migration delays, and increase natural spawning success. This might be accomplished by introducing a later timed stock such as Lewis River or Cowlitz River fall chinook or selecting later returning adults from the existing run.

1.16.3 Potential Reforms and Investments:

Reform/Investment 1: Develop acclimation sites lower in the watershed to promote increased natural spawning by fall chinook.

Reform/Investment 2: The Intake and Passage Report indicates that the screens and passage are not in compliance with current standards. As a R/I we recommend the capitol projects for compliance be invested in to provide future programmatic adaptive management strategies that will protect listed fish as well as integrate hatchery programs.

Reform/Investment 3: Fall chinook should be mass marked so that a measure of wild fish integration into the hatchery program and the proportion of hatchery spawners in the river can be accurately measured. Coded-wire-tagging and recovery programs must be sufficiently funded to meet the current management and science needs. Measures of spawning escapement including the proportion of hatchery and wild spawners must be accurate and precise and population estimates should include confidence intervals. Limited information is available on the wild juvenile migration pattern of tule fall chinook salmon in the Lower Columbia ESU. Monitoring of hatchery and wild chinook migration should be considered in the Washougal, or other basins in the Lower Columbia River ESU, to address this issue.

Reform/Investment 4: The trap and handle facility has several issues related to unsafe handling of adult listed fish. A complete investigation and comprehensive re-design is needed to accommodate a facility that can be installed and removed without putting machinery in the stream, as well as a trap facility that will sort, return to the stream, and/or load fish with a water to water transfer method to cause no harm to hatchery or wild stocks. Sorting and handling, in general, is very hard on adult fish and routinely causes mortality. This can be prevented with a modern semi-automated sorting and handling system. This sorting system would be comprised of an initial holding pond that would collect and hold the fish until sorting is initiated by opening a gate, 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 provides 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 activates the paddles to direct the fish to the desired location. Staff does not physically handle the fish during this sorting process.

Reform/Investment 5: Mitchell Act funding has not kept up with fish production programs, or monitoring and evaluation needs for many years. As a result, two of the eight WDFW Mitchell Act hatcheries are closed, overall fish production is 14% lower than the average for the past 24

year period, and the needs for adequate monitoring and evaluation continues to escalate with ESA requirements. Additive to this growing problem is the facilities aging infrastructures. In the area of compliance, we find it very difficult to continue programs with a high level of confidence and still sustain ESA compliance in the screening, adult handling, and passage. The solution to many of the existing problems is Capitol and Operations budgets that will meet the deficiency's we describe in this process.

Reform/Investment 6: To use Salmon Falls Fishway as a trap, extensive modifications will need to be made and funds will be needed to operate the trap. Two designs have been suggested: 1) A wire strung above the 500 year flood elevation, bolted into the bedrock on either side. A curtain of weighted stringers would lie over the upstream side of the falls to block jumping fish. 2) A wood or steel lip or platform extending out over the face of the falls would look more natural from a distance, reducing potential complaints.

Section 2: Program Effects on ESA-Listed Salmon Populations

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

Program is described in "Authorization for Washougal programs includes Biological Assessment For The Operation Of Hatcheries Funded by The National Marine Fisheries Service (March 99)". Statewide Section 6 consultation with USFWS for interactions with Bull Trout. By 2004 WDFW is writing HGMP's to cover all stock/programs produced at Washougal including; Columbia River Chum, fall chinook, coho, summer and winter run steelhead.

2.2 Provide 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
Chinook	H	H
Chum Natural	M	L
Summer Steelhead	H	H
Late Winter Steelhead-Natural	H	H
Coho- Natural and Hatchery (Proposed)	Na	Na
H, M and L refer to high, medium and low ratings, low implying critical and high healthy.		

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

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

Lower Columbia River fall chinook salmon were listed as "threatened" under the ESA in May 24, 1999.

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

Columbia River chum salmon Mainstem Chum were listed as threatened under the ESA on March 25, 1999.
Lower Columbia River Steelhead were listed as threatened under the ESA on March 19, 1998.
Lower Columbia River/Southwest Washington coho salmon were proposed for listing 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 to review population status within these ESUs 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: 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 these ESUs and develop critical and viable population thresholds. WDFW has submitted natural and hatchery management guidelines for Washougal fall chinook that will be used in the interim until the TRT recommendations are developed (Fall 2003). Native fall chinook have been reported in the Washougal, but a distinct stock no longer exists. The Washougal River fall chinook natural spawners are a mixed stock of composite production. Natural spawning does occur but these fish are identified as hatchery strays. Washougal River fall chinook spawn in the area from Salmon Falls (RM 14.5) downstream approximately 4.0 miles. Natural spawning occurs in the Washougal River slightly later (October to November) than other lower Columbia River tule fall chinook stocks. Natural escapement is estimated using spawning ground counts within selected index areas. Natural spawn escapements from 1967-1991 averaged 1,832 with a low return of 70 in 1969 and a peak return of 4,578 in 1989. Since 1971, the annual natural escapement has averaged 2,157 fish. SaSI (2002) listed the Washougal River fall chinook natural spawn stock status as healthy based on escapement trend. Although final escapement objectives have not been established by the NMFS through a recovery plan, WDFW (2003) has established interim minimum escapement objectives. The minimum fall chinook MSY escapement goal is 3,000 adult spawners from the mouth of the Washougal River to the Washougal Salmon Hatchery.

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

Columbia River chum salmon *(Oncorhynchus keta*) Mainstem Chum within the lower Columbia River Evolutionary Significant Unit (ESU) are federally listed as threatened effective May 24, 1999).

Status: Historically, chum salmon were abundant in lower portions of the Columbia River and supported annual harvests of hundreds of thousands of fish. Currently, relative abundance of chum salmon is likely less than one percent of historical levels and spawning is known to occur in only three streams (Hardy Creek, Hamilton Creek, and Grays River). Spawner surveys of chum salmon in three streams indicated that a few hundred to 10,000 chum salmon spawn each year in the Columbia River Basin. The factors for decline in naturally reproducing chum salmon populations are primarily attributed to habitat degradation, water diversions, harvest, dams, loss of estuarine habitats, and artificial propagation. Presently, there are no recreational or commercial fisheries for chum salmon in the Columbia River although some fish are incidentally taken in the gill-net fisheries for coho and chinook salmon. Fall chinook releases

into the mainstem Washougal enter the Columbia system approximately 20 miles downstream of Hardy and Hamilton Creek and approximately 100 miles upstream of the Grays River which are the last known chum spawning areas in the Columbia. As chum emerge in mid March and spend minimal time in freshwater, the window for chum migration is believed to be complete by early spring prior to the Washougal program fall chinook releases in June and July. There have been a few historical records of chum salmon in the mainstem Washougal River. However, recent surveys were conducted primarily for fall chinook coded wire tag recoveries and upstream of typical chum spawning areas. They were not conducted during chum spawning times or at downriver spawning locations. In 1998, WDFW performed limited non-index spawning ground surveys and found one chum in the Washougal. In 2000, BPA funded PSMFC to conduct more intensive non-index surveys. One chum was found in Lacamas Creek, a downstream tributary (RM 0.8) of the Washougal, in 2000.

Table 3. Peak spawning ground counts for chum salmon in index reaches in the LCMA (M Groesbeck WDFW; Streamnet).

Fall Chum Return Year	Grays River				Hamilton Creek			Hardy Creek
					Spawning Channels			
	Mainstem	West Fork	Crazy Johnson Creek	Total	Hamilton	Spring	Total	
1990	569	0	117	686	35	16	51	192
1991	327	37	239	603	8	11	19	206
1992	3,881	491	374	4,746	141	8	149	1,153
1993	2,334	113	91	2,538	16	4	20	395
1994	42	0	105	147	47	22	69	435
1995	219	0	483	702	4	16	20	214
1996	1,302	408	463	2,173	5	81	86	273
1997	79	55	485	619	31	114	145	105
1998	154	214	145	513	43	237	280	443
1999	222	100	927	1,249	17	165	182	157
2001	1,124	833	249	2,206	56	143	199	20
2002	448	1,630	1,260	3,338	226	462	688	498
2003								

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.

Status of summer and winter runs: There is strong concern about the pervasive influence of hatchery stocks within the ESU. There is no tribal or direct commercial fishery on steelhead although incidental catch of wild steelhead may occur in the lower Columbia River fall gill-net fishery. Winter steelhead are distributed in the mainstem Washougal, the Little Washougal and various tributaries within the Washougal sub-basin. Generally, Dougan Falls (RM 21.6) is considered the upstream extent of winter steelhead distribution in the mainstem Washougal. Winter steelhead also move well into the headwaters of the Little Washougal watershed. Accurate run size and harvest estimates of wild winter steelhead do not exist. The SASSI stock status of winter steelhead in the Washougal River was "unknown" in 1992. The LCSCI stock status update in 1998 listed the stock as "depressed" based on a short-term severe decline. The SaSI spawner escapement goal was 841 wild winter steelhead for the Washougal mainstem. This escapement goal for wild winter steelhead was lowered to 541 fish with the LCSCI update.

Returns of winter steelhead have been only 28% of the escapement goals for the Washougal, and returns of summer steelhead have been <40% of the escapement goals.

Timing of adult migration most likely occurs January through May, with peak movement in March. The Skamania Hatchery is located on the lower end of the North Fork Washougal and has been stocking hatchery steelhead into the river system since 1957. Approximately 60,000 hatchery winter steelhead smolts are released annually in the Washougal River. These smolts are Skamania origin steelhead, reared primarily at the Skamania Hatchery on the Washougal, but also at the Vancouver and Beaver Creek facilities. Interbreeding between hatchery and wild steelhead is thought to be very low because of the run timing. Wild summer steelhead in the mainstem Washougal River and tributaries are native distinct stock based on the geographical isolation of the spawning population. Similar to other wild summer steelhead stocks in the lower Columbia River area, run timing is generally from May through November and spawn-timing is generally from early March to early June. Limited spawner surveys and snorkel surveys of summering adults indicated low numbers of adult steelhead but not enough data was available at the time to assess the status of the stock. In a more recent study, the steelhead stock was determined to be "depressed" due to chronically low escapement measures taken between 1952 and 1997.

Table 4. Wild summer steelhead abundance estimates in the LCMA (FMEP 2003).

Brood Year	Pop Est. Trap	Snorkel Surveys			Index/Redds
	Kalama	EF Lewis	Washougal	Wind	Wind
1990	745		156	116	228
1991	704		31	123	294
1992	1,075		77	129	287
1993	2,283		71	101	
1994	1,041		49	104	
1995	1,302		70	136	84
1996	614	85	44	96	
1997	598	93	57	106	106
1998	205	61	112	44	
1999	220	60	115	43	96
2000	140	99	118	26	
2001	329	117	145		
2002	Na	Na	Na	Na	Na
2003	Na	Na	Na	Na	Na

Table 5. Wild winter steelhead abundance estimates in the LCMA.

Brood Year	Index Redd Surveys					Pop. Est. Trap Counts		Index Trap/redd
	Coweeman	SF Toutle	Green	EF Lewis	Washougal	NF Toutle	Kalama	Cedar Creek
1990	522	752	86	102		36	419	
1991		904	108	72	114	108	1,128	
1992		1,290	44	88	142	322	2,322	
1993	438	1,242	84	90	118	165	992	
1994	362	632	128	78	158	90	853	
1995	252	396	174	53	206	175	1,212	
1996	44	150				251	853	70
1997	108	388		192	92	183	537	78
1998	314	374	118	250	195	149	438	38
1999	126	562	72	276	294	129	562	52
2000	290	490	124	207	939	238	941	
2001	284	334	192	79	216	185	1085	
2002	Na	Na	Na	Na	Na	Na	Na	Na
2003	Na	Na	Na	Na	Na	Na	Na	Na

Lower Columbia River Coho (*Oncorhynchus kisutch*) was currently proposed for listing as threatened on June 14, 2004.

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.

Washougal River wild coho run is a fraction of its historical size. In 1949, it was estimated that the Washougal had spawning area for 6,000 pair of salmon; 5,000 below Salmon Falls and 1,000 between Salmon and Dougan Falls. In 1951, WDF estimated coho escapement to the basin to be 3,000 fish. Hatchery production accounts for most coho returning to the Washougal River while natural coho production is presumed to be very low. Natural coho production is limited to lower river tributaries downstream of Dougan Falls and has persisted at low levels in the Little Washougal River. Coho have been planted in the Washougal basin since 1958 with extensive hatchery coho releases having occurred since 1967. Current program rears 3.0 million late coho but only releases 0.5 million into the Washougal River; the remaining 2.5 million are released into the Klickitat River as per a management plan agreement with the Columbia River tribes.

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: Until mass marking, hatchery Chinook cannot be identified from listed chinook. The Washougal hatchery could also collect coho and steelhead. Staff can quickly distinguish wild steelhead with adipose fin and transport fish back to an approved upstream site as indicated by Region 5 staff. Listed chum are not seen this high up in the system. Proposed listed coho are later in the season. See also take Tables at the end of this document.

Genetic introgression: When hatchery and wild salmon interbreed genetic material is exchanged between both groups. When mass marking is implemented, a known level of integration can begin. Indirect take from genetic introgression is unknown. There are no known genotypic, phenotypic, or behavioral differences between either the hatchery stock or natural stock in the subbasin and recent estimates indicate 80% of the natural spawners are hatchery origin fall chinook. Indirect take from genetic introgression is unknown.

Rearing Program:

Operation of Hatchery Facilities: Washougal Hatchery withdraws water from the river at two locations; one is at the hatchery intake while another intake is situated 0.5 miles upstream. This can further reduce low flows in late summer and early fall from the sections between the intake to where the non-consumptive water rejoins the river (a distance of ½ mile) (Mitchell Act Hatcheries Intake and Passage Study -April 2003). Water withdrawal is permitted, intake and screening compliance has been assessed and solutions identified. Hatchery effluent discharges fall within NPDES guidelines. Indirect take for hatchery operations is unknown.

Disease: Outbreaks in the hatchery may cause significant adult, egg, or juvenile mortality. Over the years, rearing densities, disease prevention and fish health monitoring have greatly improved the health of the programs at the Washougal Hatchery. Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1994) chapter 5 have been instrumental in reducing disease outbreaks. Although pathogens occur in the wild and fish might be affected, they are believed to go undetected with predation quickly removing those fish. 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; Steward and Bjornn 1990). Prior to release, the populations 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. 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 release program (4,000,000) is a reduction of approximately 29% from the mid 1990's due in part to Mitchell Act funding reductions but also to reduce ecological interactions. Program is released during a time period and population smolt condition that results in rapid migration to minimize density effects on listed fish. 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 1999).

2) NMFS (2002) noted that "..where inter-specific 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."
5) Studies by Fuss et al. (2000) on the Elochoman River and Riley (2004) on two Willapa Bay tributaries (Nemah and Forks) indicate that hatchery reared coho and chinook can effectively leave the systems within days or weeks.

Predation (Freshwater): When discussing predation 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). WDFW is unaware of any studies that have empirically estimated the predation risks to listed juvenile Chinook, chum or steelhead posed by the Washougal Hatchery programs. In the absence of site-specific empirical information, the identification of risk factors can be a useful tool for reviewing hatchery programs while monitoring and research programs are developed and implemented.

Predation Risk Factors:

Environmental Characteristics: Peak flows generally occur in winter months and low

flows occur in late summer. The median flow from mid-November to April is approximately 1,000 cubic feet per second (cfs), compared to flows of near 70 cfs in late summer. The 37-year average discharge is 873 cfs, with a highest-recorded flow of 40,000 cfs in December 1977. During release periods, flows average 500-700 cfs (May to June), and 300 – 500 cfs (June to July) for emigration and dispersal.

Dates of Releases: Chinook smolts are released in two groups. The bulk of the chinook (3.5 million) are released earlier (June) at approximately 70 fpp (82 mm fl) with a later group of 500,000 released in July at a larger size of approximately 55 fpp (91 mm fl). This staggered release scheme allows dispersal of early releases with both occurring after listed chum have migrated from the subbasin. This strategy has also given time for additional growth for zero age Chinook, steelhead and proposed coho.

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" is valid for listed species until further data for this system can be collected.

Potential Washougal fall Chinook predation and competition effects on listed salmonids: The proposed annual production goal for this program is 4,000,000 fish. Both windows of release of Washougal chinook could encounter listed chinook as Lower Columbia fall chinook emigrate from March – August. This window of release could encounter listed fish (emerging chinook, steelhead and chum) in the Washougal sub-basin and Columbia mainstem. Sub-yearlings would not likely compete for food or habitat with fingerling stocks due to smolted condition. At 65 fpp (86 mm fl) to 50 fpp (93 mm fl), chinook pose an unknown risk on listed fish less than 31mm fl. Below are some data available for chinook fry and fingerling lengths from area Lower Columbia streams. The magnitude of predation will depend upon the characteristic of the listed population of salmonids and the habitat in which the population occurs. Due to size and release times, predation on listed fish is unlikely.

Below are some of the data that is available for chinook fry and fingerling lengths from area Lower Columbia streams:

- Lengths from the Lewis River system during the month of June indicate fish 48-55 mm fl (Columbia River Progress Report 2003-16). The Lewis River system fall chinook stock timing though is the latest for the Columbia tributary stocks, and considered to be the worst case scenario (smaller size) when compared to other Columbia River systems.
- Abernathy Creek (WRIA 25) indicated lengths of 36mm – 40mm from March to April 1 (P. Hanratty, WDFW, pers comm. 2004).

- Average fork length, by week from 26 sampling sites on the Kalama River, indicate fish 44 mm fl (April 25), 46 mm fl (May 3), 56 mm fl (May 11) and 62 mm fl (May 16). Other lengths through August are available (R. Pettit WDFW, pers. comm.).
- Fork lengths from Cedar Creek (tributary to the N.F. Lewis River) indicate that average chinook lengths reach approximately 50 mm fl between the weeks of April 12 and April 19, 2004, and are growing rapidly with fish 55-60 mm fl by April 26 and May 3, 2004.

For chum impact, mean lengths from the Grays River Hatchery and Sea Resources (Chinook River) Chum Recovery programs indicate chum releases are: 56.2 – 58.8 mm fl (in mid-March), 55.2 mm fl (late March), and 54.6 mm fl in mid-April (Lower Columbia Chum HGMP 2004). For the Duncan Creek and Ives Island Chum Recovery programs, fish are released at 1.0-1.5 grams or 50-55 mm fl on a staggered basis from mid-March through May (Bonneville Population of Columbia River Chum Salmon HGMP 2004). Additionally, 95% of the chum emigration was completed by May 1, 2003 and by April 22, 2004 (See Figure 1.).

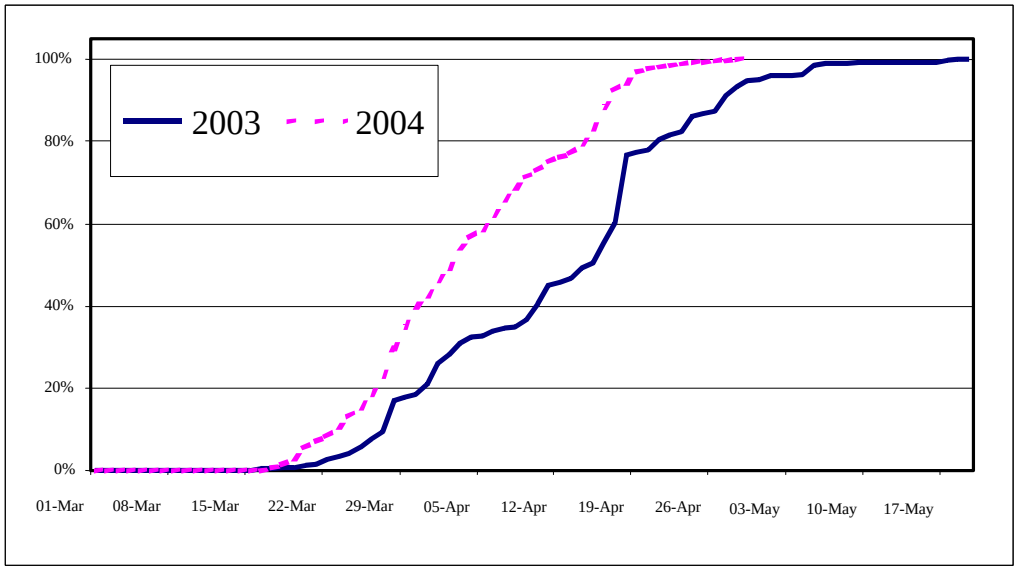

Figure 1. Chum salmon out migration timing at Duncan Creek for Brood Year 2002 & 2003.

Impact for listed steelhead is unknown but spawning time for wild winter steelhead stocks in the ESU occurs from March to May with April 20th the peak week of spawning and depending on available temperature units, eggs will hatch in 4-7 weeks with fry emergence approximately 2-3 weeks after hatching which indicates listed fish not available until late May to mid June (LCSI Draft 1998). Summer steelhead are approximately a month earlier. Indirect take from this potential predation is unknown.

Table 6. 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 listed coho in the Lower Columbia ESU is unknown. Depending on water temperatures, hatchery coho fry during the month of April can range from 42 – 40 mm fl and be 50 mm fl by the first of May (Washougal Hatchery coho growth data 2004).Indirect take from competition or predation is unknown.

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

- Feeding rates and regimes through out the rearing cycle are programmed to satiation feeding to minimize out of size fish and programmed for smolt phase as release or plant times approach.
- Based on past history, fish have reached a size and condition that indicates a smolted condition at release.
- Releases occur within known time periods of species emigration from acclimated ponds.
- Releases from these ponds are volitional with large proportions of the populations moving out initially with the remainder of the population vacating with in a couple of days.
- Minimal residualism from WDFW programs following these guidelines has been indicated from snorkeling studies on the Elochoman River (Fuss 2000). 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) s concluded that predation by hatchery production on wild salmonids does not significantly impact naturally produced fish survival in the Columbia River migration corridor. He also stated there are no studies demonstrating that numbers of Columbia system smolts emigrating to the ocean can be associated with a change in the survival rates of juveniles in the ocean in part because of the dynamics of fish rearing conditions in the ocean. Indirect takes on migration corridor and the 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 and 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.

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 the end of this document for identified levels).

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.

Take of chinook has been unknown, take of chum has not been documented in this operation. Listed steelhead and listed coho (proposed) have been sorted and released upstream. No pond mortalities have been reported by staff.

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 fall chinook salmon from Washougal Hatchery 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 fall Chinook salmon from Washougal 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).

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

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.

WDFW has received authorization for tributary, Columbia River mainstem, and ocean fisheries. The combined harvest rates in the Fisheries Management and Evaluation Plan (FMEP), Columbia River Fish Management Plan (CRFMP), and ocean fisheries are reviewed annually in the North of Falcon process to ensure the harvest rates are consistent with recovery of the Lower Columbia river tule chinook population.

Columbia River fall chinook production (predominately from hatcheries) is a major contributor to the catches in Washington and Oregon ocean fisheries. Significant commercial net catch and recreational fishing occurs in the mainstem as well and minor catches are recorded in individual tributary streams. The primary objective for most lower river chinook production is directed at providing harvest opportunities outside the Washougal River with lower Columbia chinook more heavily impacted by ocean fisheries. The ocean exploitation rate for tule fall chinook averaged 53% from 1977 to 1990 and was reduced to 25% between 1991 and 1994. The combined mainstem and tributary fishery impacts for tule chinook are less than 50% of the ocean fishery and have been reduced from 11% to 5%. This includes ocean fisheries and mainstem Columbia fisheries. Current escapement goals are thus focused on achieving hatchery escapement. Generally, the terminal recreation fisheries harvests about 10 percent of the total number of chinook entering any particular tributary.

Fall chinook are harvested in ocean commercial and recreational fisheries from Oregon to Alaska, in addition to Columbia River commercial gill net and sport fisheries. Lower Columbia tule fall chinook are important contributors to the Washington ocean sport and troll fisheries and to the Columbia River estuary sport fishery. Columbia River commercial harvest occurs primarily in September, but tule chinook flesh quality is low once the fish move from salt water; the price is low compared to higher quality bright stock Chinook. Ocean and mainstem Columbia combined harvest is limited to 49% as a result of ESA limits on Coweeman tule fall Chinook. Current annual harvest rate dependent on management response to annual abundance in PSC (U.S/Canada), PFMC (U.S. ocean), and Columbia River Compact forums. Coded wire tag (CWT) data analysis of the 1989-1994 brood years indicates a Washougal fall chinook harvest rate of 28% during the mid 1990s. The majority of 1989-94 brood Washougal fall chinook harvest occurred in Southern British Columbia (35.0%), Alaska (22%), Columbia River (16%), and Washington ocean (14%) fisheries. Sport harvest in the Washougal River averaged

477 fall chinook annually from 1977-1987 (LCFRB Subbasin Reports Volume II, Chapter 15 Washougal River Subbasin 2004).

Return Year	Hatchery Escapement	Total Catch (all ages)
1990	4814	
1991	3877	
1992	4840	296
1993	3174	1076
1994	4593	2039
1995	7421	3001
1996	10180	3942
1997	6121	1277
1998	3768	1851
1999	1598	4557
2000	1969	1551
2001	7324	8332
2002	7549	
2003		

3.4 Relationship to habitat protection and recovery strategies.

Sub-Basin Planning and Salmon Recovery - The current Washougal HGMP processes are designed to deal with existing hatchery programs and potential reforms to those programs. A regional sub-basin planning process (Draft Washougal River Subbasin Summary May 17, 2002 and May 2004) is a broad-scale initiative that will provide building blocks of recovery plans 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 the Washougal Complex.

Habitat Protection -WDFW is presently conducting or has conducted habitat inventories within the Washougal 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) that 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 - A WRIA 28 (Salmon/Washougal Watershed) habitat limiting factors (LFA) analysis has been completed by the Washington State Conservation Commission (Wade G**.,** March 2001) with input from WDFW Region 5 staff. Major impacts include fish habitat degradation from the upper Washougal River system reaches downstream to the mouth in Camas. The Yacolt Burn deforested large tracts of land in the upper reaches causing an increase in sediment transport, a reduction in hydrologic retention, and a general decline in habitat quality. Gravel extraction in the lower 20 miles of the river has caused a loss in suitable spawning substrate through this reach. Three dams were constructed by the Cotterell Power Company, which prevented fish passage during low flows. These dams contained fish ladders that were deemed inefficient (WDF 1990). The dams were eventually removed in 1947. Effluent from the Kraft pulp mill located at the mouth of the Washougal River in Camas has been directly

recognized as a contributor of fish mortality (WDF 1990; WDF 1951). Water quality remains a problem and the Washougal River is listed on the 303d list (WDOE) along with several of its' tributaries.

3.5 Ecological interactions.

Below are discussions on both negative and positive impacts relative to the Sea Resources coho 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: Chinook smolts can be preyed upon release through the entire migration corridor from the river subbasin to the mainstem Columbia River and estuary. Northern pikeminnows (beginning at RM 4.0) and introduced spiny rays along the Columbia mainstem sloughs can predate on coho smolts. Also, avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons are predators. Mammals such as these can take a heavy toll on migrating smolts while harbor seals, river otters, sea lions and Orcas prey on returning adults.

(2) Salmonid and non-salmonid fishes or species that could be negatively impacted by the program: Co-occurring natural salmon and steelhead populations in local tributary areas and the Columbia River mainstem corridor areas could be negatively impacted by program fish. Of primary concern are the ESA listed endangered and threatened salmonids: Snake River fall-run Chinook salmon ESU (threatened); Snake River spring/summer-run Chinook salmon ESU (threatened); Lower Columbia River Chinook salmon ESU (threatened); Upper Columbia River spring-run Chinook salmon ESU (endangered); Columbia River chum salmon ESU (threatened); Snake River sockeye salmon ESU (endangered); Upper Columbia River steelhead ESU (endangered); Snake River Basin steelhead ESU (threatened); Lower Columbia River steelhead ESU (threatened); Middle Columbia River steelhead ESU (threatened); and the Columbia River distinct population segment of bull trout (threatened). Listed fish can be impacted through a complex web of short and long term processes and over multiple time periods which makes 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, Type N coho and steelhead are released in the Washougal River system and 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. Chinook smolts can be preyed upon release through the entire migration corridor from the river subbasin to the mainstem Columbia River, estuary and in the immediate ocean system by piscivorous salmon species. Northern pikeminnow, introduced spiny rays in the Columbia mainstem sloughs can predate on coho smolts as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons. Mammals that benefit from migrating smolts and returning adults include: harbor seals, sea otters, sea lions and Orcas. 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. Spawning adults originating from this program may provide a source of nutrients in oligotrohic coastal river systems and stimulate stream productivity. 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). The nutrient enhancement from spawned adults from hatchery (carcass) and wild salmonid and non-salmonid species may contribute nutrients that increase overall productivity in the watershed, reducing inter-species interactions. The Washougal River drainage is thought to be inadequately seeded with anadromous fish carcasses and a program has been initiated with the use of volunteers (Lower Columbia Fishery Enhancement Group, Camas/Washougal Fish and Habitat League) to distribute carcasses throughout the basin.

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.

Water is supplied from a pumped intake on the Washougal River. Five pumps deliver river water to the hatchery. During lower use periods, the river intake supplies 3,500 gpm (7.8 cfs) in November and December to a maximum 7,500 gpm (16.7 cfs) from March through August. Spring water from Boyles Creek is located approximately 75 yards from the hatchery and supplies 2300 gpm (5 cfs) non-turbid and minimal silt laden water to the hatchery during high flow river events and is used for ponds 1 thru 6 as well as 25, 26 & 27 for fall chinook rearing. Since this is a short stream springing from a spring source, the agency has determined there are no fish populations within this stretch and does not need a screen intake. A gravity intake on Bob's Creek is located 1/3 mile from the grounds and supplies 2.5 cfs for incubation. Due to the steep elevation and grade, the stream is a natural barrier to fish and does not have fish. "C-Creek", another small spring source used in the past, is not used anymore (Richard Johnson, pers. comm., 2004).

During summer, water from the river intake reflects elevated temperatures. Water temperature data collected at the Washougal Salmon Hatchery between 1987 and 1991 also documents high water temperatures in the upper Washougal basin. During this 5-year recording period, water temperatures at the hatchery frequently exceeded 17.8°C during July, August and September; in some cases for as long as 17 days in a row.

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 15,061 gpm from four sources: Washougal River, Bob Creek, Boyle Creek and C-Creek. Are formalized through trust water right #S2-25274 from the Department of Ecology. Feeder creek streams are spring fed and determined to be non-fish bearing streams, therefore, of no impact. Monitoring and measurement of water usage is reported in monthly NPDES reports (see below).
Intake/Screening Compliance	Intake structures were designed and constructed to specifications at the time the Washougal facility was constructed. The Mitchell Act Intake and Screening Assessment (2002) has identified design and alternatives needed to get existing structures compliant including Washougal Hatchery. Intake screens and velocity are not compliant with NOAA fish screening standards. Allowable velocity of 0.40 fps is exceeded and the backup pump is to close to the screen area causing high approach velocities. From the assessment, WDFW has been requesting funding for future scoping, design, and construction work of a new intake system.
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 provides effluent monitoring and reporting and operates within the limitations established within the permit (permit # WAG 13-1044). It is administered by the Washington Department of Ecology (DOE). 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):* 1 to 2 times per month on composite effluent, maximum effluent and influent samples. *Settleable Solids (SS):* 1 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).

Broodstock is collected by volitional return to the adult capture pond and are held for up to 30 days in the adult holding pond.

Ponds (number)	Pond Type	*Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
1	Asphalt Adult Holding Pond	100825	185	109	5.0	11225

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

Adult fish are not transported from station.

5.3 Broodstock holding and spawning facilities.

Integrated Hatchery Operations Team (IHOT) adult holding guidelines are followed for adult holding, density, water quality and alarm systems. Adults are seined, sorted, killed and spawned directly from the adult holding pond. Fish not ready to spawn are returned to the pond for further maturation. Spawning for this program takes place in a covered area.

5.4 Incubation facilities.

In the incubation room, fertilized eggs are incubated in deep troughs until eyeing and then moved to Heath stack incubators for hatching. Water source is from Bobs Creek (spring water). Standard 1:6000 (1667ppm) formalin drip treatments to controls fungus on eggs are administered 15 minutes, 6 times a week.

Incubator Type	Units (number)	Flow (gpm)	Volume (cu.ft.)	Loading-Eyeing (eggs/unit)	Loading-Hatching (eggs/unit)
Heath Stack Trays (72 unit stacks with 16 trays/stack)	1152	3-5	nya	nya	10000
Deep Troughs with Cell Baffles (9 cells/Trough)	4	8-12	nya	100000	nya

5.5 Rearing facilities.

Swim up fry are ponded into concrete raceways. After initial rearing in concrete raceways, fingerlings are separated to larger receptacles for rearing until sub-yearling release in the summer.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Flow Index	Max. Density Index
6	Concrete Raceways	5000	80	20	3.1	265	2.69	0.17
1	Earthen Pond (0.3 acres)	100000	nya	nya	nya	4000	2.57	0.31
1	Earthen Pond (0.3 acres)	120000	nya	nya	nya	4000	2.57	0.31
1	Earthen Pond (1.1 acres)	420000	nya	nya	nya	7000	2.03	0.07

5.6 Acclimation/release facilities.

Same, see HGMP Section 5.5.

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

Program has experienced operational difficulties during drought events, which caused problems in water availability and quality (temperature). Icing and slushing problems during the winter within the ponds can be a problem. Otherwise, the facility does not experience abnormal operational difficulties.

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.

Potential Hazard	**Risk Aversion Measure**
Equipment failure/Water loss	One main river pump is kept specifically for backup purposes in case of mechanical failure. Backup generator system is automatic in case of power loss. Multiple water sources (Boyles and Bob's Creeks) are gravity fed and can be used in case of total power and/or backup generator failure.
Flooding/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 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.

Section 6. Broodstock Origin and Identity

6.1 Source.

Program broodstock is derived from adults volitionally returning to the Washougal Hatchery. In the past ten years, only in 1999 did the program require eggs from another facility (Elochoman) to make up for shortages.

6.2.1 History.

This is a mixed stock with composite production and is similar in life history to other tule fall chinook stocks in the lower Columbia. Broodstock are collected/acquired randomly through the run entry pattern to Washougal Hatchery according to protocols and guidelines that have been set forth by agency geneticists. The adult returns to the Washougal Hatchery have exceeded 3000 fish during the period of 1990 to present. The program collects sufficient broodstock to maintain an effective population size of 1000 fish per generation.

Broodstock Source	Origin	Year(s) Used	
		Begin	End
Washougal River Tule Fall Chinook	H	1990	Present
Spring Creek NFH Tule Fall Chinook	H	1991	1991
Kalama Hatchery Tule Fall Chinook	H	1993	1993
Elochoman Hatchery Tule Fall Chinook	H	1999	1999

6.2.2 Annual size

WDFW has established an egg take goal of 4.7 million eggs in the Future Brood Document (FBD). To meet this goal a total of 1045 females and 1045 males need to be collected annually, based on an average fecundity of 5000 eggs/female and pre-spawning mortality of 10%. At the pre-season meeting Fish and Hatchery Program staff will develop the weekly and cumulative broodstock collection goals and evaluate run size forecasts.

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

The portion of wild and hatchery portion is not known and a level of integration has not been determined. When mass marking occurs, the TRT will be determining those levels. Mark-recapture carcass tagging experiments are used to estimate the abundance of chinook salmon in the Washougal basin. In years when there is no carcass tagging, population estimates are based on the expansion factor that compares the total population estimate divided by the peak live and dead counts.

6.2.4 Genetic or ecological differences.

Since 1953, 16 different stocks have been released from the hatchery, and with the exception of a transfer of 1.2 million upriver bright fall-run chinook from Priest Rapids Hatchery, these transfers have consisted of lower Columbia River fall run tule stocks (Myers et al.1995). Current broodstock collection comes from adults returning to the hatchery with most years from 1993 being of Washougal returns except for Elochoman River fall Chinook in 1999. Genetic analysis of Washougal fall chinook in 1995 and 1996 indicated that they were significantly different from other lower Columbia River chinook stocks, except for Lewis River bright fall chinook.

6.2.5 Reasons for choosing.

This stock has a run entry pattern and timing that provides harvest opportunities for fisheries in the subbasin, the lower Columbia mainstem/tributaries, and the Washington/Oregon coast. The broodstock chosen has the desired life history traits to meet harvest goals. Over the years, the Tule fall chinook stock used in the Washougal program has traits (e.g run-timing) that provides significant harvest to the ocean fisheries and lower Columbia River fisheries (e.g. Buoy 10).

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.

- Every effort shall be made to promote local adaptation of this fall chinook population and out of basin hatchery transfers of eggs or fish for use as broodstock will only be considered in extreme cases.
- Since 1993, the fall Chinook program has consisted of Washougal returns except for 1999.
- There are no known genotypic, phenotypic, or behavioral differences between either the hatchery stock or natural stock in the sub-basin.
- Holding pond procedures follow IHOT guidelines.
- Other listed fish, if identified, will be released immediately if encountered during the broodstock collection process.
- Although final escapement objectives have not been established by the NMFS through a recovery plan, WDFW has established interim minimum escapement objectives. The minimum fall chinook MSY escapement goal is 3000 adult spawners from the mouth to the Washougal Salmon Hatchery.

Section 7. Broodstock Collection

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

Adults for broodstock.

7.2 Collection or sampling design.

The adult collection occurs mostly during September, October and November. Collection occurs at the hatchery rack where fish are diverted into a fish ladder and into the adult holding pond. Hatchery egg take goal is for Washougal needs but also any Lower Columbia River Tule Fall chinook program that may request eggs for their programs. Egg take goal objectives include: taking eggs across the run, collecting brood proportional to the run return, on low return years build in a buffer early in the season to ensure egg take is met, adjust collection of adults in-season based on actual returns and measure fecundity and mortality in-season and adjust egg take as needed. Surplus fish can be used for nutrient enhancement in the subbasin and once needs are satisfied, any additional surplused fish could be available for sale to a contract buyer.

Rogue River fall chinook are reared for the Oregon Select Area fisheries program and these can be identified by an adipose and left ventral fin clip. These fish are excluded from the broodstock and should be sacrificed for CWTs to maintain local genetic diversity and adaptation.

7.3 Identity.

Fall chinook were native to the Washougal River but a distinct stock may no longer exist. Natural spawning does occur, but many are identified as hatchery strays. Washougal River fall chinook spawn in the area from Salmon Falls (RM 14.5) downstream approximately 4.0 miles. Natural spawning occurs in the Washougal River slightly later (October to November) than other lower Columbia River tule fall chinook stocks. Natural escapement is estimated using spawning ground counts within selected index areas. Straying of lower river hatchery (LRH) fall chinook from a number of Oregon and Washington hatcheries is not unusual, and contributes to natural production. The overall result of straying and transfers of fall chinook at lower Columbia River hatcheries is the development of a widely distributed, blended hatchery stock. This is a mixed stock with composite production (SaSI 2002) and is similar to the life histories of other tule fall chinook stocks in the lower Columbia.

7.4 Proposed number to be collected:

7.4.1 Program goal (assuming 1:1 sex ratio for adults): 2090 plus 1% jacks.

7.4.2 Broodstock collection levels for the last twelve years (e.g. 1990-2001), or for most recent years available.

Year	Adults		
	Females	Males	Jacks
Planned	1045	1045	20
1990	1847	1204	11
1991	1197	1174	10
1992	2565	2011	33
1993	914	1293	26
1994	1993	1752	62
1995	2511	1966	26
1996	2063	1989	13
1997	1213	757	38
1998	1301	1371	11
1999	539	546	15
2000	872	845	9
2001	1243	1253	4
2002	962	962	1
2003	905	900	7

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

At the pre-season meeting Fish and Hatchery Program staff will develop the weekly and cumulative broodstock collection goals and evaluate run size forecasts. In years of high abundance where hatchery swim-ins exceed broodstock goals, fish may be surplused after nutrient enhancement goals are met. While we still have a viable contract for carcasses, the nutrient enhancement will be the choice for the Washougal Hatchery. Any nutrient enhancement occurring below the Washougal Salmon Hatchery must be approved by the Fish Program and all female and male carcasses released in this area shall have their bellies slit to distinguish them from natural spawners.

7.6 Fish transportation and holding methods.

No hauling is required, adult returning fish enter the adult holding pond volitionally .

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
1	Asphalt Adult Holding Pond	100825	185	109	5.0	11225

7.7 Describe fish health maintenance and sanitation procedures applied.

Integrated Hatchery Operations Team (IHOT), Pacific Northwest Fish Health Protection committee (PNFHPC), WDFW's Fish Health Manual November 1966, updated March 30, 1998 or tribal guidelines are followed. Fish health specialists make monthly visits and consult with staff. The adult holding area is separated from all other hatchery operations. All equipment and personnel use disinfection (chlorine) procedures upon entering or exiting the area. Fish treatments are rare and only for fungus control using formalin bath treatments.

7.8 Disposition of carcasses.

Washougal fall chinook carcasses have been used by the Lower Columbia Fishery Enhancement Group (LCFEG) for nutrient enhancement in past years. A contract exists for carcasses, but nutrient enhancement is a priority for the watershed. But in years of large escapement, fish can be surplused after nutrient needs are fulfilled. A "Nutrient Enhancement" plan needs to be completed for the Washougal River watershed. The highest priority for hatchery carcasses are the mainstem Washougal River and tributaries above the salmon hatchery.

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.

- Every effort shall be made to promote local adaptation of this fall chinook salmon population and out of basin hatchery transfers will only be considered in extreme cases.
- Broodstock will be collected, throughout the entire run time, from adults arriving at the rack.
- Broodstock collection and sorting procedures can quickly identify non-target listed fish if encountered
- Rogue River fall chinook are reared for the Oregon Select Area fisheries program and these can be identified by an adipose and left ventral fin clip. These fish are excluded from the broodstock and are sacrificed for retrieval of CWTs to maintain local genetic diversity and adaptation.

Section 8. Mating

8.1 Selection method.

Cohorts are utilized from the entire run cycle with males and females available on a given day mated randomly. Spawning is conducted weekly and occurs over a period of up to six weeks with the peak in October.

8.2 Males.

The spawning protocol is described in the IHOT 1995 Volume III as follows; The intent is to use a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks with pooled gametes. When spawning more than one million eggs in a day, the ratio will not be less than 1 male to 3 females. Jacks are incorporated into the spawning at approximately 1.0% (1:100 ratio).

8.3 Fertilization.

Disinfection procedures that prevent pathogen transmission between stocks of fish are implemented during spawning. Spawning implements are rinsed with an iodophor solution and spawning area and implements are disinfected with iodophor solution at the days end of spawning. Fertilization occurs at a 1:1 ratio (females/males). Ovarian fluid is not drained prior to fertilization. Water hardening procedures with iodophor are followed.

8.4 Cryopreserved gametes.

Not used.

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

- Every effort shall be made to promote local adaptation of this fall chinook salmon population and out of basin hatchery transfers will only be considered in extreme cases.
- Mating cohorts are randomly selected.
- Broodstock will be collected through out the run time from adults arriving at the hatchery rack.
- Protocols for population size, fish health disinfection and genetic guidelines followed.

Section 9. Incubation and Rearing.

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

A total of 3,000 eyed eggs are transferred to the Kesinger remote site incubator (RSI) project. An additional 500 eyed eggs are given to Region 5 salmon in the classroom (SIC) projects.

Year	Egg Take	Green-Eyed Survival (%)	Eyed-Ponding Survival (%)	Fry-fingerling Survival (%)
1990	7809900	93.2	99.17	86.9
1991	5182100	94.7	97.7	98.8
1992	7584500	94.96	93.2	97.0
1993	3833000	94.8	99.1	99.22
1994	8806900	94.17	97.7	97.18
1995	10710000	93.93	nya	98.45
1996	8620000	95.72	93.3	99.5
1997	5065000	95.55	97.81	97.6
1998	6777400	95.25	99.46	97.88
1999	2645000	94.02	98.75	98.46
2000	4011200	86.94	97.4	98.4
2001	5593500	92.80	99.00	93.31
2002	4700000	nya	nya	nya
2003	3948490	Na	Na	Na

9.1.2 Cause for, and disposition of surplus egg takes.

None for the most part. Eggtakes are planned according to data/information of historical eggtakes at the Washougal Hatchery. Thus, eggtakes are maintained within the plus/minus 5% guideline of the Section 7 permit. BKD and viral sampling lots (60 fish lots) are conducted over the course of the season. Lots are removed for unacceptable levels of BKD and with any protocols involved due to viral sampling.

9.1.3 Loading densities applied during incubation.

Eggs are placed in deep troughs to the eyed stage then moved to stack incubators for hatching. Removal of dead eggs, accurate enumeration and loadings are adjusted during this time. See section 5.4 for loading and hatching criteria. Integrated Hatchery Operations Team (IHOT) species-specific incubation recommendations are followed for water quality, flows, temperature, substrate, and incubator capacities.

9.1.4 Incubation conditions.

Integrated Hatchery Operations Team (IHOT) species-specific incubation recommendations are followed for water quality, flows, temperature, substrate and incubator capacities. Harmful silt and sediment is cleaned from incubation systems regularly while eggs are monitored to determine fertilization and mortality. Incubation water is from Bob's Creek and temperature is monitored by thermograph and recorded and temperature units (TU) are tracked for embryonic development. Dissolved oxygen content is monitored and have been at acceptable levels of saturation with a minimum criteria of 8 parts per million (ppm). When using artificial substrate, vexar or bio-rings, egg densities within incubation units are reduced by 10%.

9.1.5 Ponding.

Fry are ponded when a visual inspection of the amount of yolk sac remaining shows a yolk slit closed to approximately 1 millimeter wide (approximately 1600 TU's). At this time fry are transferred to the appropriate starter raceway (See HGMP Section 5.5 for raceway specifications) during the last two weeks of January.

9.1.6 Fish health maintenance and monitoring.

IHOT and WDFW fish health guidelines are followed. Hatchery staff conducts daily inspections, visual monitoring and sampling from eyed, fry, fingerling and sub-yearling stages. As soon as potential problems are seen, these concerns are immediately communicated to the WDFW fish health specialist. In regular monitoring, fish health specialists conduct inspections monthly. Potential problems are managed promptly to limit mortality and reduce possible disease transmission.

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

- IHOT and WDFW fish health guidelines are followed
- Multiple units are used in incubation
- Disinfection procedures are implemented during incubation that prevent pathogen transmission between stocks of fish
- Vertical stacks with splash curtains are isolation units separate from adjacent stacks
- Temperature, dissolved oxygen and flow are monitored
- Low water alarms monitor all units

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.

Year	Egg Take	Green-Eyed Survival (%)	Eyed-Ponding Survival (%)	Fry-fingerling Survival (%)
1990	7809900	93.2	99.17	86.9
1991	5182100	94.7	97.7	98.8
1992	7584500	94.96	93.2	97.0
1993	3833000	94.8	99.1	99.22
1994	8806900	94.17	97.7	97.18
1995	10710000	93.93	nya	98.45
1996	8620000	95.72	93.3	99.5
1997	5065000	95.55	97.81	97.6
1998	6777400	95.25	99.46	97.88
1999	2645000	94.02	98.75	98.46
2000	4011200	86.94	97.4	98.4
2001	5593500	92.80	99.00	93.31
2002	4700000	Na	Na	Na
2003	3948490	Na	Na	Na

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, and loading densities.

9.2.3 Fish rearing conditions.

Fish are reared in ponds 1 thru 6 as well as 25, 26 & 27. Temperature, dissolved oxygen and pond turn over rate are monitored. IHOT standards are followed for: water quality, alarm systems, and predator control measures (netting) to provide the necessary security for the cultured stock. Settleable solids, unused feed and feces are removed regularly to ensure proper cleanliness of rearing containers.

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
Jan 30	34.4	1200	nya	nya
February 27	38.4	794	nya	0.338
March 27	42.7	579	nya	0.271
April 30	54.9	271	nya	0.532
May 29	68.1	142	nya	0.476
June 26	80.2	78	4.03	0.4507
July 22	89.6	54	4.22	0.308

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

See HGMP Section 9.2.4. No energy reserve data is available.

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

Rearing Period	Food Type	Application Schedule (#feedings/day)	Feeding Rate Range (%B.W./day)	Lbs. Fed Per gpm of Inflow	Food Conversion During Period
February-June	BioMoist (OMP)	8*	1.0-3.0	<.10/gpm**	0.87
February-June	Moore Clark Nutra Plus	8*	1.0-3.0	< .10/gpm**	0.55

* Frequency of feeding decreases as fish grow from fry (hourly) to smolt.(once or twice daily)
** Lbs. fed per gpm is <10/gpm in standard raceways. Parameters for larger rearing containers may exceed this due to increased volume and turnover rates.

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 Washougal Hatchery 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. 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 determined 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. 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.

- Every effort shall be made to promote local adaptation of this fall chinook salmon population and out of basin hatchery transfers will only be considered in extreme cases.
- Mating cohorts are randomly selected.
- At least 500 adults are available in the population.
- Broodstock will be collected through out the run time from adults arriving at the hatchery rack.
- Protocols for population size, fish health disinfection and genetic guidelines followed.
- Eggs water hardened in iodophor (1:600).
- Multiple incubation and rearing units are used.
- Staff is available 24/7 to respond to emergencies.
- IHOT guidelines are followed for rearing, release and fish health parameters.

Section 10. Release

10.1 Proposed fish release levels.

Age Class	Max. No.	Size (ffp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Water-shed	Eco-province
Fingerling	4,000,000	60-75	June and July	Washougal River	32.2	Washougal	Lower Columbia

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

Smolt Release: Smolts (Subyearlings) are forced/directly released from the Washougal Hatchery into the Washougal River (RKm 32.2). Staggered releases (one group of 3,500,000 is released at ~65 fpp (81 mm fl) in June and another group of 500,000 is released at ~50 fpp (90 mm fl) in July) maximize smolt quality and behavior and the release strategy reduces direct and indirect listed species interaction.

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

	Fingerling Release		
Release Year	No.	Date (MM/DD)	Avg Size (fpp)
1991	6425200	June and July	75
1992	4631200	June and July	79
1993	6226200	June and July	84 and 54
1994	3578500	June and July	91 and 78
1995	6151700	June and July	77
1996	6139000	June and July	78 and 55
1997	6282000	June and July	69 and 50
1998	4170536	June and July	73 and 52
1999	4289000	June and July	71 and 53
2000	2100584	June and July	67 and 46
2001	3717874	June and July	62 and 42
2002	4144650	June and July	70 and 65
2003	3948490	June and July	65 and 50

10.4 Actual dates of release and description of release protocols.

Smolts are forced released at a size and time of release to the Washougal River in June and July as specified by program guidelines. This window is later but lies within the normal outmigration period of naturally produced tule fall chinook. Splitting the release allows use of available water and pond space (density) for maximizing smolt quality.

10.5 Fish transportation procedures, if applicable.

Fish are released on site and do not require transport equipment.

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

Fish are reared, acclimated, and released as subyearling smolts directly from the rearing/acclimation units at the Washougal Hatchery into the Washougal River. All production occurs with a mixture of Boyles Creek, Bob's Creek, and Washougal River water giving these fish a distinct location indicator.

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

90,000 fish (4.5% of the program production) are adipose-fin clipped/coded-wire tagged (AD/CWT'd) as an index group for management purposes. Each release group (June and July) has a proportionate number of AD/ CWT'd divided within the release groups (78% of the marks are mixed in with the 3,500,000 release with the remaining 22 % with the 500,000 release). All carcasses (hatchery and stream survey) and trapped salmon are examined for fin clips (mark sampling) and snouts taken from fish with CWT.

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

None for the most part. Eggtakes are planned according to data/information of historical eggtakes at the Washougal Hatchery. Thus, eggtake and production are maintained within the plus/minus 5% guideline. For unforeseen events, the hatchery manager would contact the complex manager who would contact the regional manager to apprise him/her of the situation. Regional manager would consult with appropriate regional co-managers/NMFS to get recommendation for fish disposition. The hatchery complex manager would instruct hatchery to implement recommendation.

10.9 Fish health certification procedures applied pre-release.

Prior to release, fish are given a fish health exam. Whenever abnormal behavior or mortality is observed, staff contacts the Area Fish Health Specialist. The fish specialist examines affected fish, and recommends the appropriate treatment. Reporting and control of selected fish pathogens are done in accordance with the Co-managers Fish Disease Control Policy. All fish are examined for the presence of "reportable pathogens" as defined in the PNFHPC disease control guidelines, within 1 to 3 weeks prior to release.

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

Emergency procedures and disposition of fish would adhere to the protocols and procedures set forth in the Program Section 7 Permit. If the program were threatened by ecological or mechanical events, the Complex manager would contact and inform regional management of the situation. Based on a determination of a partial or complete emergency release of program fish, authorized personnel would pull screens and sumps and fish would be forced released into the

Washougal River. No release of fish will occur without a review by WDFW Fish Management and a risk assessment is performed.

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 floodwaters 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.

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.

a. The production and release of only smolts through fish culture and volitional release practices fosters rapid seaward migration with minimal delay in the rivers and limiting interactions with naturally produced salmonid juveniles.
b. WDFW uses acclimation and release of smolts in lower river reaches where possible. Generally, this in an area below known wild fish spawning and rearing habitat in the upper Washougal River.
c. WDFW releases are staggered during June and July which gives listed fish time to grow to a size that minimizes predation and competition impacts.
d. WDFW proposes to continue monitoring, research and reporting of hatchery smolt migratory 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.
e. WDFW fish health and operational concerns for Washougal Hatchery programs are communicated to Region 5 staff for risk management or needed treatment.

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.

Performance indicators for the hatchery program includes broodstock escapement and associated egg take, rearing and release data. Performance indicators for fisheries typically include estimates for the catch, catch rates, harvest, harvest rates, hooking mortality for fish caught and released, effort of the fishery, and catch per unit effort (CPUE) for the fishery. WDFW makes statistically based estimates of hatchery steelhead and salmon catch from the WDFW catch record card (CRC) and follow-up phone surveys. In conjunction with CRC estimates, these can be used to determine the hatchery harvest rate, interception rate for wild fish, and catch per unit effort (CPUE). Chinook and coho fisheries in major tributaries including the Grays, Elochoman, Cowlitz, Toutle, Kalama, Lewis, Washougal, Wind, and Little White Salmon Rivers are sampled to collect CWT, CPUE, and interception rate for wild fish.

Also, the above monitoring and research will be regularly evaluated by the co-managers with the intent of adjusting as appropriate the HGMPs consistent with stock recovery and fishing objectives.

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

Chinook abundance data for streams will continue with PSMFC funding. Intermittent chum surveys will continue if outside funding is secured. Baseline stream surveys should be continued for wild spawning. Staffing hours to conduct spawning grounds surveys and biological assessment is limited by funding. Funding and resources are currently committed to monitor and evaluate this program as detailed in the Lower Columbia River FMEP (2002).

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.

Spawning ground surveys and biological sampling occurring during the recovery will employ measures to ensure that effects on the survival of the listed chinook salmon population are insignificant. Salmon redds and live spawning fish will not be disturbed during surveys and sampling.

Section 12. Research

12.1 Objective or purpose.

WDFW has been examining and researching stock characteristics of hatchery reared salmonids since major propagation efforts began in the 1930's. The department is continuing to analyze trends in chinook run and spawn timing and fecundity in the Washougal system. Measuring fecundity of fall chinook salmon at Washougal Hatchery each year will determine temporal changes. Results will be compared with prior data and compared with data from other Columbia Basin hatcheries.

12.2 Cooperating and funding agencies.

National Marine Fisheries Service & WDFW

12.3 Principle investigator or project supervisor and staff.

Howard Fuss Research Scientist, 600 Capitol Way N, Olympia, WA 98501-1091
Jim Byrne, Fish and Wildlife Biologist, 600 Capitol Way N, Olympia, WA 98501-1091

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

Hatchery progeny only.

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

Individual females are measured to determine length. The age of the fish is determined by removing the snout if it contains a coded-wire tag or by removing and aging of scales if not tagged. The measured fecundity of the female is determined by passing the eggs through an electronic fish counter with accuracy of better than 95%. Fecundity by age is determined and the average measured fecundity of the brood is compared among broods and age classes.

12.6 Dates or time periods in which research activity occurs.

September through December

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

Each lot of eggs is carefully passed through the fish counter before standard shocking and picking activities by the hatchery crew. Total number of eggs are counted and the lot of eggs is replaced in the incubator for subsequent incubation and care by the hatchery crew.

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

A total of 20-30 hatchery females are used in the study.

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

Fall Chinook

ESU/Population	Lower Columbia Fall Chinook
Activity	Artificial production
Location of hatchery activity	Washougal Hatchery
Dates of activity	Sept. – Nov.
Hatchery Program Operator	WDFW

Type of Take	Annual Take of Listed Fish by life Stage (number of fish)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Removal (e.g., broodstock (e)			Up to 30	

12.10 Alternative methods to achieve project objectives:

Two alternatives exist. The first is to use estimated fecundities obtained by dividing total egg collection by total females spawned. However, a study is being done to check the accuracy of this method. The second method is to hand count the eggs.

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

Spring chinook, coho, steelhead. No associated mortality to other species is expected due to this activity.

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.

None, since there is no associated mortality to listed species expected from this activity.

Section 13. Attachments and Citations

13.1 Attachments and Citations

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11.) Hochachka, P.W. 1961. Liver glycogen reserves of interacting resident and introduced trout populations. Can. J. Fish. Aqua. Sci. 48: 125-135.

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15.) Muir, W.O. and R.L. Emmelt. 1988. Food habits of migrating salmonid smolts passing Bonneville Dam in the Columbia River, 1984. Regulated River 2: 1-10.

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1999 (R.Z Smith).

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Semi-Annual Operations Reports for Lower Columbia Fisheries Development Program Mitchell Act Hatcheries (Washington State)1987/thru/1999.

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.

Fall Chinook

ESU/Population	Lower Columbia River Fall Chinook
Activity	Washougal Fall Chinook Program
Location of hatchery activity	Washougal Hatchery
Dates of activity	September – November
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		nya
Capture, handle, tag/mark/tissue sample, and release (d)	nya	nya	nya	nya
Removal (e.g., broodstock (e)	nya	nya	2090*	nya
Intentional lethal take (f)	nya	nya	2090	nya
Unintentional lethal take (g)	423,000	384,930	nya	nya
Other take (specify) (h)	nya	nya	nya	nya

* With mas marking, an accurate level of take will be possible.
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.

Chum

ESU/Population	Lower Columbia River Chum
Activity	Washougal Fall Chinook Program
Location of hatchery activity	Washougal Hatchery
Dates of activity	Nov-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* Chum are not seen up at the hatchery rack although chum are reared at Washougal and planted down in the Columbia Mainstem (Ives Island and Duncan Creek).

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.

Winter Steelhead

ESU/Population	Lower Columbia River Steelhead
Activity	Washougal Fall Chinook Program
Location of hatchery activity	Washougal Hatchery
Dates of activity	Nov-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* Staff passes 0-8 wild steelhead a year above the weir. No mortalities are reported.

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.

Coho (Proposed)

ESU/Population	Lower Columbia River Coho
Activity	Washougal Fall Chinook Program
Location of hatchery activity	Washougal Hatchery
Dates of activity	Nov-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

*Crew passes adult coho with adipose upstream. Loss is not observed on these fish.

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