HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	Lewis River Spring Chinook
Species or Hatchery Stock	Chinook Salmon *(Oncorhynchus tshawytscha)*
Agency/Operator	Washington Department of Fish and Wildlife
Watershed and Region	Lewis Subbasin/Lower Columbia Province
Date Submitted	nya
Date Last Updated	August 16, 2004

Section 1: General Program Description

1.1 Name of hatchery or program.

Lewis River Spring Chinook

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

Chinook Salmon *(Oncorhynchus tshawytscha)*

ESA Status: Threatened

1.3 Responsible organization and individuals.

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

Co-operators	Role
PacifiCorp	Mitigation Funding Source

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

Funding Sources
PacifiCorps (Mitigation for Lost Fish Production Due to N.F. Lewis River Hydroelectric Projects).

Operational Information	Number
Full time equivalent staff	5.6
Annual operating cost (dollars)	$838,771

The costs above are associated with the Lewis River Hatchery and Speelyai Hatchery programs and cannot be broken down to specific programs.

1.5 Location(s) of hatchery and associated facilities.

Broodstock source	Lewis River Hatchery Spring Chinook
Broodstock collection location (stream, RKm, subbasin)	Lewis River Hatchery Trap/North Fork Lewis River/RKm 20.9/Lewis Subbasin; and Merwin Trap/North Fork Lewis River/RKm 25.8/Lewis Subbasin
Adult holding location (stream, RKm, subbasin)	Speelyai Hatchery/North Fork Lewis River/RKm 45.1/Lewis Subbasin
Spawning location (stream, RKm, subbasin)	Speelyai Hatchery/North Fork Lewis River/RKm 45.1/Lewis Subbasin
Incubation location (facility name, stream, RKm, subbasin)	Speelyai Hatchery/North Fork Lewis River/RKm 45.1/Lewis Subbasin
Rearing location (facility name, stream, RKm, subbasin)	Speelyai Hatchery/North Fork Lewis River/RKm 45.1/Lewis Subbasin; Lewis River Hatchery Trap/North Fork Lewis River/RKm 20.9/Lewis; and Echo Cove Net Pens//North Fork Lewis River/RKm 16.1/Lewis Subbasin

1.6 Type of program.

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

1.7 Purpose (Goal) of program.

- Plant 900,000 smolts at 10.0 ffp into the Lewis River.
- Provide 200,000 eyed eggs for transfer to Grays River Hatchery for the Deep River Net Pen Programs.
- Provide 150,000 smolts for release from the Fish First (WDFW Co-op) Echo Bay Net Pens.
- The purpose is to mitigate Columbia River spring chinook production (predominately from hatcheries), which 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 in individual tributary streams.
- Operate hatcheries consistent with the recovery of spring chinook salmon in the Lewis River. The major hatchery issues are: 1) to maintain the genetic diversity of spring chinook in the Lewis River, and ensure the reproductive success of wild spring chinook meets or exceeds recovery goals, 2) minimize the ecological interactions of hatchery spring chinook on naturally produced salmon and steelhead, and minimize the mortality of naturally produced juvenile and adult salmon and steelhead due to facility operations.

1.8 Justification for the program.

- Legal justification includes: PacifiCorp Hydro mitigation, Columbia River Fisheries Development Program, Columbia River Fish Management Plan and *U.S. v Oregon* court agreements.
- WDFW protects listed fish and provides harvest opportunity on Lewis River spring chinook through the Fish Management and Evaluation Plan (FMEP). The objectives of the WDFW's FMEP are based on the WDFW Wild Salmonid Policy. In that policy, it states that harvest rates will be managed so that 1) spawner abundance levels abundantly utilize available habitat, 2) ensure that the number and distribution of locally adapted spawning populations will not decrease, 3) genetic diversity within populations is maintained or increased, 4) natural ecosystem processes are maintained or restored, and 5) sustainable surplus production above levels needed for abundant utilization of habitat, local adaptation, genetic diversity, and ecosystem processes will be managed to support fishing opportunities (WDFW 1997). In addition, fisheries will be managed to insure adult size, timing, distribution of 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 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 populations in the Lower Columbia River (LCR) Evolutionary Significant Unit (ESU) will be managed to promote the recovery of these species. The Congressional motivation for Mitchell Act passage was recognition that the salmon fishery of the Columbia River was in a serious and progressive decline due to habitat destruction and alteration from dam construction and operation, deforestation and other forest practices, pollution, water diversions, and over fishing.

In order to minimize impact on listed fish by WDFW facilities operation and the Lewis Spring Chinook program, the following Risk Aversion are included in this HGMP:

Table 1. Summary of risk aversion measures for the Lewis River Spring Chinook program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.2	Water rights are formalized thru trust water right #S2-10532 (Speelyai Hatchery) and S2-24939 (Lewis River Hatchery) from the Department of Ecology. Monitoring and measurement of water usage is reported in monthly NPDES reports.
Intake Screening	4.2	WDFW has requested funding for future scoping, design, and construction work of a new river intake system on Lewis River to meet NOAA compliance.
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 13-1040 Lewis River Hatchery) and WAG 13-1041 (Speelyai Hatchery).
Broodstock Collection & Adult Passage	7.9	All fish are mass marked prior to release. Broodstock collection and sorting procedures can quickly identify listed non-target listed fish, and if encountered, are released per protocol to minimize impact as determined by WDFW 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* (Fish Health 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 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 0.38 % smolt-to-adult survival (range 2.04-0.06) that includes harvest plus escapement (3,420 fish at current production levels).	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. Maximize available Natural Origin Broodstock (NOB).	A minimum of 800 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). Adhere to WDFW Stock Transfer guidelines. (WDFW 1991).
Region-wide, groups are marked in a manner consistent with information needs and protocols to estimate impacts to natural and hatchery origin fish	Use mass-mark (adipose-fin clip) for selective fisheries with additional groups (Ad+CWT (and (CWT only) for evaluation purposes.	Returning fish are sampled throughout their return for length, sex, and mark.
Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens. Follow Co-managers Fish Health Disease Policy (1998).	Necropsies of fish to assess health, nutritional status, and culture conditions	WDFW Fish Health Section inspect adult broodstock yearly for pathogens ans parasites and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, WDFW's Fish Health Section recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as deemed necessary A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.
	Release and/or transfer exams for parasites and pathogens.	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.	At spawning, lots of 60 adult broodstock are examined for pathogens
	Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens.	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 (10 fish/lb) and released from the hatchery at a time that fosters rapid migration downstream. Mass mark production fish to identify them from naturally produced fish (except CWT only groups)	As identified in the HGMP: Monitor size, number, date of release and mass mark quality. Additional WDFW projects: straying, instream evaluations of juvenile and adult behaviors, NOR/HOR ratio on the spawning grounds, fish health documented.
Artificial production facilities are operated in compliance with all applicable fish health guidelines, facility operation standards and protocols including IHOT, Co-managers Fish Health Policy and drug usage mandates from the Federal Food and Drug Administration.	Hatchery goal is to prevent the introduction, amplification or spread of fish pathogens that might negatively affect the health of both hatchery and naturally reproducing stocks and to produce healthy smolts that will contribute to the goals of this facility.	Pathologists from WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed.
Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring.	NPDES permit compliance WDFW water right permit compliance	Flow and discharge reported in monthly NPDES reports.
Water withdrawals and instream water diversion structures for hatchery facility will not affect spawning behavior of natural populations or impact juveniles.	Hatchery intake structures meet state and federal guidelines where located in fish bearing streams.	Barrier and intake structure compliance assessed and needed fixes are prioritized.
Hatchery operations comply with ESA responsibilities.	WDFW completes an HGMP and is issued a federal and state permit when applicable.	Identified in HGMP and Biological Opinion for hatchery operations.
Harvest of hatchery-produced fish minimizes impact to wild populations.	Harvest is regulated to meet appropriate biological assessment criteria. Mass mark juvenile hatchery fish prior to release to enable state agencies to implement selective fisheries.	Harvests are monitored by agencies and tribes to provide up to date information.

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

800 adults (400 females and 400 males).

A pre-season meeting between Hatchery and Fish Programs staff will occur to review past hatchery operations, natural escapement, and to develop a plan for weir and hatchery operations during each upcoming season. Since run size predictions are not always accurate and run timing varies annually, programs must maintain flexibility to meet the 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
Yearling	900,000 (FBD)	10.0	March	Lewis	20.9	Lewis	Lewis

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

The average smolt-to-adult survival rates for 1988-1999 brood years was 0.38%.

Brood Year	Smolt to Adult Survival (%)	Return Year	Total Catch (all ages)	Spawning Ground Escapement	Hatchery Escapement
1989	0.46	1989		3,483	
1990	0.64	1990		1,345	1,322
1991	0.03	1991		1,601	596
1992	0.28	1992	585	1,254	466
1993	0.13	1993	414	1,412	678
1994	0.18	1994	1,047	475	776
1995	0.07	1995	2,538	270	1,553
1996	0.48	1996	395	493	1,054
1997	0.06	1997	592	410	2,245
1998	0.15	1998	666	211	1,028
1999	0.03*	1999	314	240	846
Na		2000	1,227		777
Na		2001	1,772		1,176

* Incomplete data. WDFW Hatchery data records: WDFW Stock Assessment Report; Annual Coded-Wire Tag Program, Washington Missing Production Groups

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

The first year of operation for this hatchery was 1974

1.14 Expected duration of program.

On-going

1.15 Watersheds targeted by program.

Lewis Subbasin/Lower Columbia Province

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

1.16.1 Brief Overview of Key Issues:

Spring chinook are collected at Merwin Dam and are transported to Speelyai Hatchery where they are held until ripe, spawned, and incubated. Final rearing and release takes place at Lewis River Hatchery. The rearing situation at Lewis River is not the best, only two large ponds are available for rearing, resulting in a high density and with associated water quality problems, heightened disease problems occur. The current re-licensing process is requesting rehabilitation of existing and additional facilities to improve spring chinook rearing program.

1.16.2 Potential Alternatives to the Current Program:

Alternative 1: Truck the smolts down to the lower river and release below the rearing area of wild fall chinook and other ESA listed species. WDFW has determined that these fish out-migrate quickly and do not have a significant impact on ESA listed juveniles rearing in the NF Lewis River. Trucking of this stock would reduce survival and WDFW does not support this alternative.

1.16.3 Potential Reforms and Investments:

Reform/Investment 1: There is potential for reintroduction above the projects with relicensing. The current Fish and Hatchery Management Plan is being negotiated for the new licensing agreement with Pacific Power where it is hoped that these needs will be included. The process has identified numerous changes to all facilities to facilitate better rearing, trapping, hauling, and holding facilities.

Section 2: Program Effects on ESA-Listed Salmonid Populations

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

Program is described in "Biological Assessment For The Operation Of Hatcheries Funded by The National Marine Fisheries Service (March 99)". By 2004, WDFW is writing HGMP's to cover all stock/programs produced at Lewis Complex including; spring chinook, coho, summer and winter run steelhead.

2.2.1 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
Spring Chinook-Hatchery	M	H
Fall Chinook Tule-Natural	L	M
Fall Chinook LRB-Natural	H	M
Late Winter Steelhead-Natural	M	M
Coho- Hatchery and Natural (Proposed)	Na	Na
H, M and L refer to high, medium and low ratings, low implying critical and high healthy.		

Identify the ESA-listed population(s) that will be directly affected by the program.
Lower Columbia River chinook salmon ESU (threatened effective May 24, 1999)

Identify the ESA-listed population(s) that may be incidentally affected by the program.
Listed salmon and steelhead present in LCR include

Lower Columbia River chum salmon ESU (threatened effective May 24, 1999)
Lower Columbia River steelhead ESU (threatened effective May 18, 1998).
Columbia Basin DPS Bull Trout (threatened on June 10, 1998 (63 FR 31647)).
Lower Columbia River Coho is currently a candidate for listing,
(Proposed as threatened on June 14, 2004.)

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

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

Lower Columbia River spring chinook salmon *(Oncorhynchus tshawytsch*a)
At one time, an indigenous stock of spring chinook existed in the Lewis River, but with the construction of Merwin Dam (RM 19.5) in 1931, the majority of the spawning reaches became inaccessible and the stock subsequently declined. Early attempts to save the stock through hatchery production failed. By 1950, only a remnant population existed in the river, spawning primarily in the waters immediately below Merwin Dam and Cedar Creek. In 1971, managers used the Carson Hatchery stock, which originated from Bonneville Dam fishway. These fish were

reared and released from Speelyai Hatchery. Since then, releases have been made from both the Speelyai and the Lewis River hatcheries. The stocks used now include Cowlitz and Kalama, along with on-station returns to the Lewis River. The 1977 through 1987 average run size to the Lewis River was estimated at about 6,000 fish, with about 10 percent of the returns constituting jacks. Annual returns during this time period have ranged from about 2,300 adults in 1980 to nearly 17,000 adults in 1987. Although the spring chinook has a low contribution rate in terms of ocean harvest, returns do provide mainstem recreational fisheries and a popular sport fishery within the Lewis River. In river sport catch estimates during 1977 through 1987 have ranged from about 1,250 to nearly 10,000 adults, with an average annual catch of about 3,660 adults. In addition, number of jacks are also taken, a significant averaging about 400 per year, Natural escapement of adult fish, ground counts, based on annual spawning have averaged about 1,400 adults, ranging from just over 300 to nearly 7,000 adults. The remainder of the fish return to the hatcheries, which suffer from poor returns due to low trapping efficiency.

Table 2. Spring chinook salmon abundance estimates in the LCR (included hatchery and wild fish, FMEP 2003).

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

Lower Columbia River fall chinook salmon *(Oncorhynchus tshawytsch*a) within the Evolutionary Significant Unit (ESU) are federally listed as "threatened" under the Endangered Species Act. . In Washington, the LCR chinook ESU includes all naturally spawned chinook populations from the mouth of the Columbia River to the Cascade Crest. As defined by harvest management units, there are four stocks of fall chinook that return to the Columbia River. These include the lower river hatchery (LRH), lower river wild (LRW), Bonneville Pool Hatchery (BPH) and the upriver brights (URB**).** The North Lewis wild fall chinook represent about 80 percent of the wild fall chinook returning to the lower Columbia River, (Norman, 1987). LRW fish also return to the East Fork Lewis. In addition, LRW fish are also found in the Cowlitz and Sandy rivers. Hatchery production of fall chinook has been inconsistent in terms of numbers and types of releases. Some release groups were for experimental rather than production purposes. After brood year 1985, no hatchery production has taken place. Current production is entirely natural. Natural spawning over the last 10 years has ranged from about 5,300 to 19,000 adults. Escapement estimates are based on peak fish counts, which are used as an index to estimate total spawners. The majority of the spawning takes place within the 4- mile stretch between the Lewis River Hatchery and Merwin Dam, in addition to Cedar Creek. Surveys are also conducted in the East Fork Lewis River within the 4.2-mile stretch from the area of Lewisville Park to Daybreak Park.

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

Lower Columbia River steelhead *(Oncorhynchus mykiss*), were listed as threatened under the ESA on March 19, 1998. In Washington, the LCR steelhead ESU includes winter and summer steelhead in tributaries to the Columbia River between the Cowlitz River and Wind River. No total estimates of wild run size or escapement exist for either the North or East Fork Lewis River. Smoker et al. (1951) believed that combined winter and summer runs of native steelhead on the North Fork above Merwin Dam formerly exceeded 1,000 adults. Lucas (1985) determined that the wild component of winter steelhead at Lucia Falls averaged 56% (ranged 35-74 percent) of the creeled fish between 1973 and 1984. Specific age information for wild fish is limited. Of the 12 wild winter steelhead sampled from the 1977-1980 seasons in the North Fork fishery, 17 percent were l-ocean jacks and 83 percent were 2-ocean adults (Lavoy and Fenton 1983). In another study by the same authors, hatchery and wild fish were not separated; of 364 fish from the North Fork winter fishery, the largest group (63 percent) was 2- ocean fish with fork lengths that averaged between 67.1 cm and 71 cm. Three-ocean fish made up the next largest group (30 percent) and had average fork lengths of 80.1 cm to 84.2 cm. Only 2 percent of l-ocean fish were found, with fork lengths of 44 cm and 46 cm. Adult winter steelhead enter the basin from November through May with peak migration occurring in January and March for hatchery and wild fish, respectively. Spawning occurs from March through June in both the North and East forks (Howell et al. 1985). Lucas and Pointer (1987) found that peak spawning during the 1987 brood year in the East Fork occurred from mid-March through late April. McMillan (1985) suggests that spawning above Sunset Falls on the East Fork occurs over a short period of time in mid-March. Emergence occurs from April through July and the fish rear until spring a year later. Most wild North Fork smolts probably outmigrate in April and May at a size of 160 mm. The majority (83 percent) were found to have emigrated after two years, while about 17 percent emigrated after three years (Lavoy and Fenton 1983). East Fork stocks tend to follow the same time- frame, however no distribution of freshwater residency is available.

Table 4. Wild winter steelhead abundance estimates in the LCMA.

Brood Year	Index Redd Surveys					Pop. Est. Trap Counts		IndexTrap/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

Columbia Basin DPS Bull Trout *(Salvelinus confluentus)* were listed as threatened on June 10, 1998 (63 FR 31647). The Columbia River Distinct Population Segment is threatened by habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, and past fisheries management practices such as the introduction of non-native species. The Lower Columbia Recovery Unit Team identified two core areas (Lewis and Klickitat rivers) within the recovery unit. Generally, in drainages colonized by anadromous salmon and steelhead, char successfully co-exist by occupying a different ecological niche. Coho smolt releases in the lower mainstem reaches of the Lewis River are believed to migrate quickly with low incidences of residuals and interaction with bull trout. The U.S. Fish and Wildlife Service recognized two sub-populations of bull trout in the Lewis River system: the Yale Reservoir Sub-Population and the Swift Reservoir Sub-Population (USDI 1998a and 1998b). Both sub-populations exhibit an adfluvial life history type. Adult fish reside in the reservoirs for the majority of the year and then migrate into the main river or its tributaries during late spring. Adult fish hold in their spawning tributaries throughout the early summer months, then spawn in August and September. After spawning, the adult fish return to the reservoirs until the following year's spawning season. Cougar Creek is the only tributary to Yale Reservoir where bull trout are known to spawn. The Yale Reservoir Sub-Population contains a low number of fish, coming dangerously close to extinction. PacifiCorp has been conducting bull trout spawner counts on Cougar Creek since 1978. The estimated Cougar Creek spawner population ranges from zero to 40 individuals (PacifiCorp and Cowlitz PUD 1999a, 100% Initial Information Package). Pine and Rush creeks are believed to be the principal spawning tributaries supporting the Swift Reservoir Sub-Population (Faler and Bair 1996). A cooperative monitoring effort began in the early 1990s on the Swift Reservoir Sub-Population. The primary cooperators include the Washington Department of Fish and Wildlife, PacifiCorp, and U.S. Forest Service. In the early 1990s, radio-tagging of adult bull trout was conducted to determine distribution of spawners. Beginning in 1994, population size estimates have been made on an annual basis using a visual mark-recapture method.

Lower Columbia River Coho *(Oncorhynchus kisutch)* was proposed 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 (NMFS, 2004b). Coho historically spawned throughout the basin. Natural spawning is thought to occur in most areas accessible to coho; coho currently spawn in the North Lewis tributaries below Merwin Dam including Ross, Cedar, NF and SF Chelatchie, Johnson, and Colvin Creeks; Cedar Creek is the most utilized stream on the mainstem. Construction of Merwin Dam was completed in 1932; coho adults were trapped and passed above Merwin Dam from 1932-1957; the transportation of coho ended after the completion of Yale Dam (1953) and just prior to completion of Swift Dam (1959). As part of the current hydro re-licensing process, reintroduction of coho into habitat upstream of the three dams (Merwin, Yale, and Swift) is being evaluated. Late stock coho (or Type N) were historically present in the Lewis basin with spawning occurring from late November into March. Early stock coho (or Type S) were historically present in the Lewis basin with spawning occurring from late October to November. Columbia River early and late stock coho produced at Washington hatcheries are genetically similar. Lewis River wild coho run is a fraction of its historical size. An escapement survey in the late 1930s observed 7,919 coho in the North Fork. In 1951, WDF estimated coho escapement to the basin was 10,000 fish in the North Fork (primarily early run). Escapement surveys from 1944-1999 on the North and South Fork Chelatchie, Johnson, and Cedar Creeks documented a range of 1-584 fish/mile. Currently, hatchery production accounts for most coho returning to the Lewis River. Natural coho production is presumed to be generally low in most tributaries. A smolt trap at lower Cedar Creek has shown recent year coho production to be fair to good in North and South forks of Chelatchie Creek (tributary of Cedar Creek) and in the mainstem Cedar Creek.

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.

Hatchery activities 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: All broodstock used for the program at Lewis River hatchery are volunteers to the traps at Lewis and Merwin. The traps are opened for chinook collection during the entire length of the run to allow for collection of the entire run timing populations. Both traps are supplied with Lewis River water, both traps have "V" weirs to prevent the escape of captured fish. Fish are handled without the use of an anesthetic at this time but future use of anesthetics in the Merwin trap may be an option. All fish are identified as to wild or hatchery origin through examination for fin clips or wire tags and observed for gill net or predator marks. The incidence of fall chinook capture has ranged between 100 and 300 adults yearly (volunteered into traps). The incidence on other listed fish (winter and summer steelhead) has been low. A total of 6 and 8 wild summer steelhead volunteered into the traps in 1999 and 2000, respectively. See Take Tables for direct take.

Genetic introgression: In principle, the Lewis River Hatchery (LRH) will be operated to mimic the Lewis River natural spring chinook population. By agreeing to these principles, WDFW has acknowledged that there will be no selection for size, run timing, and spawning time in spring chinook retained for broodstock and that out of basin transfers of fish and eggs used for broodstock will not occur, except in extreme situations and only after consultation with WDFW Regional /NOAA staff. There are no known genotypic, phenotypic, or behavioral differences between either the hatchery stock or natural stock in the subbasin. Indirect take from genetic introgression is unknown.

Rearing Program:

Operation of Hatchery Facilities: Potential facility operation impacts on listed fish include; water withdrawal, hatchery effluent, and intake compliance. Monitoring and maintenance are conducted along with staff observations. Effluent at outfall areas is rapidly diluted with main stem flows and operation is within permitted guidelines. (See HGMP Sections 4.1 and 4.2). Indirect take from this operation 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 Lewis River 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 as predation quickly removes 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; Stewart and Bjornn 1990; Foot et al. 2000). Prior to release, the health and condition of the coho population is established by the Area Fish Health Specialist. This is commonly done 1-3 weeks pre-release but maybe up to 6 weeks at hatcheries 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 may 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. Spring Chinook releases are scheduled to start mid-March. 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." Studies have shown that coho moved downstream quickly, suggesting that coho spend little time in the river after release (Fuss and Byrne 1995). Coho smolts released from the Marblemount Hatchery on the Skagit River migrated approximately 11.2 river miles per day (Puget Sound data from Seiler et al. 1997; 2000). Fish released on-station into large river systems may travel even more rapidly – migration rates of approximately 20 river miles per day were observed by steelhead smolts in the Cowlitz River (Harza 1998). Snorkeling studies on the Elochoman River indicated few hatchery released chinook remaining after 2 weeks (Fuss 2000).
2) NMFS (2002) noted that "...where interspecific populations have evolved sympatrically, chinook salmon and steelhead have evolved slight differences in habitat use patterns that minimize their interactions with coho salmon (Nilsson 1967; Lister and Genoe 1970; Taylor 1991). Along with the habitat differences exhibited by coho and steelhead, they also show differences in foraging behavior. Peterson (1966) and Johnston (1967) reported that juvenile coho are surface oriented and feed primarily on drifting and flying insects, while steelhead are bottom oriented and feed largely on benthic invertebrates."

3) Flagg et al. (2000) concluded, "By definition, hatchery and wild salmonids will not compete unless they require the same limiting resource. Thus, the modern enhancement strategy of releasing salmon and steelhead trout as smolts markedly reduces the potential for hatchery and wild fish to compete for resources in the freshwater rearing environment. Miller (1953), Hochachka (1961), and Reimers (1963), among others, have noted that this potential for competition is further reduced by the fact that many hatchery salmonids have developed different habitat and dietary behavior than wild salmonids." Flagg et al (2000) also stated "It is unclear whether or not hatchery and wild chinook salmon utilize similar or different resources in the estuarine environment."
4) Fresh (1997) noted that "Few studies have clearly established the role of competition and predation in anadromous population declines, especially in marine habitats. A major reason for the uncertainty in the available data is the complexity and dynamic nature of competition and predation; a small change in one variable (e.g., prey size) significantly changes outcomes of competition and predation. In addition, large data gaps exist in our understanding of these interactions. For instance, evaluating the impact of introduced fishes is impossible because we do not know which nonnative fishes occur in many salmon-producing watersheds. Most available information is circumstantial. While such information can identify where inter- or intra specific relationships may occur, it does not test mechanisms explaining why observed relations exist. Thus, competition and predation are usually one of several plausible hypotheses explaining observed results."
5) Studies from Fuss (2000) on the Elochoman River and Riley (2004) on two Willapa Bay tributaries (Nemah and Forks Creek), indicate that hatchery reared coho and chinook effectively leave the watersheds within days after release.

Predation (Freshwater): Spring chinook yearlings from this program may prey upon listed species of salmonids, but the magnitude of predation will depend upon the characteristic of the listed population of salmonids, the habitat in which the population occurs and the characteristics of the hatchery program (e.g.. release time, location, number released and size upon release). The site specific nature of predation and the limited number of empirical studies that have been conducted, make it difficult to predict the predation effects of this specific hatchery release.

WDFW is unaware of studies that have estimated the predation risks to listed fish posed by the Lewis River Hatchery spring chinook program. 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: These characteristics can influence the level of predation (see SIWG (1984) for a review) with risk greatest in small systems during periods of low flow and high clarity. The Lewis River watershed is a large system approximately 93 miles long, has a total fall of approximately 12,000 feet, and drains an area of about 1,050 square miles (EA Engineering 1999). The headwaters arise on the southern flanks of Mt. Saint Helens and Mt. Adams. The mainstem of the Lewis, also known as the North Fork, flows southwesterly from its source in Skamania County through three impoundments, Swift Reservoir (River Mile 47.9), Yale Reservoir (34.2), and Merwin Lake (RM 19.5). The middle and lower sections of the North Fork Lewis form the boundary between Clark and Cowlitz Counties. A major tributary, the East Fork Lewis River, enters the mainstem at RM 3.5. From this point the mainstem Lewis flows westerly, entering the Columbia River at RM 88. The average annual stream flow for the entire Lewis River system is approximately 6,125 cubic feet per second (cfs).

Dates of Releases: Spring chinook are released starting mi-March and the release takes

place over one weeks time. In 2003, this date was March 6-13. The release date can influence the likelihood that listed species are encountered. As spring Chinook releases are in early March and could vacate the system before listed fish emerge. There are limited studies on migration timing of naturally produced chinook but listed chinook from the Lower Columbia ESU are believed to emigrate over a wide window from March through August (LCFRB Technical Reports 2004).

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

- Fork lengths of naturally produced chinook 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 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). Growth for wild chinook from Abernathy Creek from the first of April to May 1 is unknown.
- Average fork lengths from 26 sampling sites on the Kalama River by week 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 thru August are available (Pettet WDFW 1990).
- 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.

Release Location and Release Type: The likelihood of predation may also be affected by the location and the type of release. Other factors being equal, the risk of predation may increase with the length of time fish co-mingle. In the freshwater environment, this is likely to be affected by distribution of the listed species in the watershed, the location of the release and the speed at which fish released from the program migrate.

We have provided a summary of empirical information and a theoretical analysis of competition and predation interactions that may be relevant to the Lewis River spring chinook program.

Potential Lewis River spring Chinook predation and competition effects on listed salmonids: The proposed annual production goal for this program is 900,000 fish. Releases average 10 FPP (155 mm fl) and are released in March. Potential prey would be

no greater than 51 mm in length (33% of 155). Hatchery migrants would encounter wild spring chinook fry and fingerlings. Spring chinook fry emerge between November and March, depending on time of egg deposition and water temperature, and spend one full year in fresh water, and emigrate in their second spring as age-2 smolts. Fall chinook emergence is believed to start in late March or April, peeking in late April and early May, in the Lewis River. Outmigration continues to late summer.

Wild summer steelhead fry emerge from March through May; juveniles generally rear in fresh water for two years; emigration occurs from March to June, with peak migration from mid-April to mid-May. Winter steelhead spawning occurs from March to May with April 20th the peak week of spawning. Depending on available temperature units, eggs will hatch in 4-7 weeks with fry emergence approximately 2-3 weeks after hatching which indicates wild winter steelhead fry would not be available until late May to mid June (LCSI Draft 1998). Additional data are presented below. Indirect take from predation or competition is unknown.

Table 5. 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 Research Report 2003

There is potential for predation by hatchery spring chinook on naturally produced coho.

Listed Coho (Proposed): Length data for wild coho in the Lewis River basin is unknown. Depending on water temperatures, during the month of April, lower Columbia River hatchery coho fry can range from 42 – 40 mm fl in early April, and 50mm fl by May 1 (LCR Hatchery data 2001). Indirect take from predation or competition is unknown.

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

- Condition factors, standard deviation and co-efficient of variation (CV) are measured through out the rearing cycle and at release.
- Feeding rates and regimes throughout the rearing cycle are programmed to satiation feeding to minimize out-of-size fish and programmed to produce smolt size fish at date of release.
- Based on past history, fish have reached a size and condition that indicates a smolted condition at release.
- Releases occur within known time periods of species emigration from acclimated ponds.
- Releases from these ponds are volitional with large proportions of the populations moving out initially with the remainder of the population vacating within days or a few weeks.
- Minimal residualism from WDFW chinook programs following these guidelines has been indicated from snorkeling studies on the Elochoman River (Fuss 2000) and on Nemah and Forks Ck. (Riley 2004). In extensive surveys conducted on the Lewis River, Hawkins and Tipping (1999) found no residualized hatchery spring chinook. 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 mainstem, Witty et al. (1995) has concluded that predation by hatchery production on wild salmonids does not significantly impact naturally produced fish survival in the Columbia River migration corridor. Evidence in estuarine and nearshore environments indicate that diets are often dominated by invertebrates. Durkin (1982) reporting that the diet of coho smolts (128-138 mm fl) in the Columbia River estuary was composed almost entirely of invertebrates without evidence of salmonids as prey (HSRG - Hatchery Reform 2004). There appear to be no studies demonstrating that large numbers of Columbia system smolts emigrating to the ocean affect the survival rates of juveniles in the ocean in part because of the dynamics of fish rearing conditions in the ocean. Indirect take in the migration corridor or ocean is unknown.

Monitoring:
Associated Monitoring Activities: The following monitoring activities are conducted in the Lower Columbia Management Area (LCMA) for adult steelhead and salmon: redd surveys are conducted for winter steelhead in the SF Toutle, Coweeman, EF Lewis and Washougal rivers. Redd surveys are also conducted in the Cowlitz River for fall and spring chinook. Mark-recapture surveys provide data for summer steelhead populations in the Wind and Kalama rivers. Mark-recapture carcass surveys are conducted to estimate populations of chinook salmon in Grays, Elochoman, Coweeman, SF Toutle, Green, Kalama, NF Lewis, EF Lewis, rivers and Skamokawa, Mill, Abernathy, and Germany creeks and for all chum salmon populations. Snorkel surveys are conducted for summer steelhead in the EF Lewis, Washougal rivers. Adult 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.
Handling and release of wild steelhead and chinook is monitored and take observations have been rare. Any additionally mortality from this operation on a yearly basis would be communicated to WDFW Fish Program and NOAA staff for additional guidance.

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 fall chinook has been unknown, Listed spring chinook, 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 spring chinook salmon from Lewis River 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
- PacifiCorp Agreement

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 spring chinook salmon from Lewis 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:

- PacifiCorp Mitigation Agreement
- 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.

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

The in-river sport fishery occurs from late February through July in the 17 miles from the mouth upstream to the deadline below Merwin Dam and is generally seven days per week. The harvest rate of the total adult return has averaged 60%. Maximum harvest rate for mainstem and in-river sport and commercial fisheries has averaged 72% (1980-1999). The in-river harvest rate on “natural” fish is very low (no unmarked chinook can be retained until August 1). Mainstem Columbia River Harvest of Lewis River spring chinook was very low after 1977 when April and May spring chinook seasons were eliminated to protect upper Columbia and Snake wild spring chinook. Mainstem Columbia harvest of Lewis River Hatchery spring chinook increased in 2001- 2002 when selective fisheries on adipose marked hatchery fish enabled mainstem spring fishing in April and May. Tributary harvest is managed to attain the Lewis River hatchery adult broodstock escapement goal.

Return Year	Total Catch (all ages)
1992	585
1993	414
1994	1,047
1995	2,538
1996	395
1997	592
1998	666
1999	314
2000	1,227
2001	1,772
2002	Na
2003	Na

3.4 Relationship to habitat protection and recovery strategies.

Merwin Hydroelectric Project – FERC:
Options for restoring and re-introduction of salmonid are being discussed with PacifiCorp. Along with current production levels for programs below Merwin Dam during the current re-licensing process.

Subbasin Planning and the Lower Columbia Fish Recovery Board (LCFRB):
The current Lewis System HGMP process is designed to deal with existing hatchery programs and potential reforms to those programs. A regional sub-basin planning process (Draft Lewis River Subbasin Summary May 17, 2002) is a broad-scale initiative that will provide building blocks of recovery plans by the Lower Columbia Fish Recovery Board (LCFRB) for listed fish. This group 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, WDFW Region 5 staff is involved in fish and wildlife planning and technical assistance in concert with the LCFRB, including the role of fish release programs originating from Lewis River Hatchery.

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

Limiting Factors Analysis:
A WRIA 27 (Kalama, North Fork Lewis River, and East Fork Lewis River/Salmon Ck.) habitat limiting factors report (LFA) has been completed by the Washington State Conservation

Commission (Wade G., March 2001) with the input of WDFW Region 5 staff.

3.5 Ecological interactions.

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

(1) Salmonid and non-salmonid fishes or species that could negatively impact the program: Lewis River spring chinook smolts can be preyed upon through the entire migration corridor from the river subbasin to the mainstem Columbia River and estuary. Northern pikeminnows and introduced spiny rays along 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 can take a heavy toll on migrating smolts and returning adults include: harbor seals, sea lions, river otters, and Orcas.

(2) Salmonid and non-salmonid fishes or species that could be negatively impacted by the program: Co-occurring natural salmon and steelhead populations in local tributary areas and the Columbia River mainstem corridor areas could be negatively impacted by program fish. Of primary concern are the ESA listed endangered and threatened salmonids: Snake River fall-run Chinook salmon ESU (threatened); Snake River spring/summer-run Chinook salmon ESU (threatened); Lower Columbia River Chinook salmon ESU (threatened); Upper Columbia River spring-run Chinook salmon ESU (endangered); Columbia River chum salmon ESU (threatened); Snake River sockeye salmon ESU (endangered); Upper Columbia River steelhead ESU (endangered); Snake River Basin steelhead ESU (threatened); Lower Columbia River steelhead ESU (threatened); Middle Columbia River steelhead ESU (threatened); and the Columbia River distinct population segment of bull trout (threatened). Listed fish can be impacted thru a complex web of short and long term processes and over multiple time periods which makes evaluation of this a net effect difficult. WDFW is unaware of studies directly evaluating adverse ecological effects to listed salmon. See also Section 2.2.3 Predation and Competition.

3) Salmonid and non-salmonid fishes or other species that could positively impact the program. Multiple programs including spring chinook, Type S and Type N coho and steelhead programs are released in this system and limited natural production of chinook, coho, and steelhead occurs in this system along with numerous non-salmonid fishes (sculpins, lampreys and sucker etc.).

4) Salmonid and non-salmonid fishes or species that could be positively impacted by the program. A host of freshwater and marine species that depend on salmonids as a nutrient and food base may be positively impacted by program fish. The hatchery program may be filling an ecological niche in the freshwater and marine ecosystem. A large number of species are known to utilize juvenile and adult salmon as a nutrient and food base (Groot and Margolis 1991; and McNeil and Himsworth 1980). Wild co-occurring salmonid populations might be benefited as hatchery fish migrate through an area. The migrating hatchery fish may overwhelm predator populations, providing a protective effect to the co-occurring wild populations. Pacific salmon carcasses are also important for nutrient input back to freshwater streams (Cederholm et al. 1999). Successful or non-successfully spawner adults originating from this program may provide a source of nutrients in oligotrohic coastal river systems and stimulate stream productivity. 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 Lewis River drainage is thought to be inadequately seeded with anadromous fish carcasses and

steelhead carcasses can be used throughout the basin. Assuming integrated spawning and carcass seeding efforts, approximately 100 – 500 spring Chinook adult carcasses could contribute approximately 1,000 – 5,000 pounds of marine derived nutrients to organisms in the Lewis River. *Saprolegniasis* occurrences in young hatchery fish have been observed in greater frequency on Mitchell Act stations that have nutrient enhancement projects and in some cases, circumstantial evidence suggests more outbreaks of gill and tail fungus are the result of nutrient enhancement efforts. Staff is continuing to monitor observations or occurrences of this possibility.

Section 4. Water Source

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

Lewis River Hatchery water rights total 38,613 gpm from three sources: the Lewis River, an unnamed stream and Colvin Creek. Total available flow for Speelyai Hatchery is 9,200 gpm from a gravity flow intake on Speelyai Creek.

All adults trapped are supplied with 100% North Fork Lewis River water with adults selected for spawning purposes transported to the Speelyai Hatchery holding pond. Here they are held in Speelyai Creek water. Water quality is quite good at Speelyai with clarity and temperatures (48-55 degrees) providing for excellent adult holding. All eggs taken are eyed at Speelyai and that portion destined for the Lewis River Hatchery program is transported back to the Lewis River Hatchery for hatching and rearing. Water temperatures at the Lewis River Hatchery range from 40-61 degrees Fahrenheit. Since this facility is receiving water from the reservoirs upstream, water clarity is usually good. Maximum inflow at Speelyai is 20 cubic feet per second (cfs) and the maximum inflow at Lewis River Hatchery 65 cfs. There would be no difference between the water used by naturally spawning populations and that being used at the Lewis facility. All water flow to the Lewis facility is provided via pumps while the water flow at Speelyai is provided by gravity.

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 are formalized thru trust water right #S2-10532 (Speelyai Hatchery) and S2-24939 (Lewis River Hatchery) from the Department of Ecology. Monitoring and measurement of water usage is reported in monthly NPDES reports.
Intake/Screening Compliance	WDFW has requested funding for future scoping, design, and construction work of a new river intake system on Lewis River to meet NOAA compliance
Hatchery effluent discharge.	The facility conducts effluent monitoring and reporting and operates within the limitations established in its National Pollution Discharge Elimination System (NPDES) permit administered by the Washington Department of Ecology - WAG 13-1040 Lewis River Hatchery) and WAG 13-1041 (Speelyai Hatchery). Discharges from the cleaning treatment system are monitored as follows: *Total Suspended Solids (TSS)*C1 to 2 times per month on composite effluent, maximum effluent and influent samples. *Settleable Solids (SS)*C1 to 2 times per week on effluent and influent samples. *In-hatchery Water Temperature* - daily maximum and minimum readings.

Section 5. Facilities

5.1 Broodstock collection facilities (or methods).

Broodstock for the program are trapped at the Lewis River Hatchery ladder (RM 15.7) and Merwin Dam (RM 19). Traps are open for adult collection for approximately 7 months to allow for collection over the entire run time. Both traps have "V" weirs to prevent the escape of captured fish. The Lewis River trap is 200' x 7' x 5' with a flow of 3,500 gpm. The Merwin trap is approximately 60' x 12' x 7' with a flow of 25,000 gpm. The following ponds are used to hold coho until spawning:

Ponds (number)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
1	Adult /Sorting Pond (Asphalt)-Lewis R.	7,000	200	7.0	5.0	3,500
1	Adult /Sorting Pond (Asphalt)- Merwin	5,040	60	12.0	7.0	25,000

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

Adult or smolts can be transported by the following tankers depending on availability and program:

Equip. Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
2 Tanker Truck (Adult and Juvenile/Smolt Transport)	1800	Y	N	5-12	nya	nya
1 Tanker Truck (Adult and Juvenile/Smolt Transport)	1100	Y	N	5-12	nya	nya

5.3 Broodstock holding and spawning facilities.

Adult spring chinook are sorted and held at both facilities for sorting and then transferred to Speelyai Hatchery. Fish are held from May to September with spawning occurring -

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
1	Adult Holding/Sorting Pond (Asphalt)	42000	140	60.0	5.0	2500-6000

5.4 Incubation facilities.

Incubator Type	Units (number)	Flow (gpm)	Volume (cu.ft.)	Loading-Eyeing (eggs/unit)	Loading-Hatching (eggs/unit)
Heath Vertical Stack Tray Units	43	3.5	nya	4300	8000

Incubation occurs at Speelyai Hatchery.

5.5 Rearing facilities.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Flow Index	Max. Density Index
6	Concrete Raceways-Speelyai Hatchery	3200	80	10	4.0	500	nya	0.5
1	1/4-Acre Pond-Speelyai Hatchery	42000	140	60	5	1200-2400	nya	0.5
1	1/2-Acre-Lewis River Hatchery	90750	220	75	5.5	4000-7500	nya	0.5
6	Net Pens-Echo Cove (Fish First)	8000	20	20	20	NA	nya	0.5

5.6 Acclimation/release facilities.

Same as above, see section 5.5.

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

Speelyai Hatchery: Flooding comprised water intake in 1976, 1977, 1996, and 1997. Lewis River Hatchery: Flooding of pump room and water intake problems in 1976, 1977, 1996, 1998, and 2003.

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.

- All pumps, broodstock holding, incubation and rearing receptacles have water loss alarms.
- Staff is available 24/7 to respond to pump failure, water loss, and flooding events.
- Fish health protocols through broodstock collection, incubation and rearing phases are followed and monitored monthly.
- Broodstock collection is checked daily for program and listed fish.

Section 6. Broodstock Origin and Identity

6.1 Source.

Broodstock used for this program is collected from the adult fish volunteering to the two trap sites at Lewis River Hatchery (RM 13) and at Merwin (RM 16). The vast majority of the fish collected are of hatchery stock. The hatchery-origin stock is mass marked (adipose fin clip only) except for a group of 75,000 (coded-wire tag + no adipose fin clip) and another group of 75,000 that is coded-wire tagged and adipose fin clipped. When adults are handled, all fish with adipose fins are checked for presence of CWT (using a hand held wand-type detector) to detect a snout tag. Those with adipose fins and no tags are marked and returned to the river as wild fish. All hatchery-origin fish trapped are either marked and recycled, spawned as broodstock, sold to contacted buyer or donated to food banks.

6.2.1 History.

Following the construction of Merwin Dam in the 1930's, attempts by this hatchery to save the indigenous Lewis River spring Chinook stock failed. The current broodstock originated from the Cowlitz Hatchery, Kalama Falls, Carson NFH, Klickitat Hatchery and Willamette River stocks (Marshall et al, 1995). Returning adults are trapped at the Lewis Hatchery and at the base of Merwin Dam at Merwin Hatchery. In the Lewis River system, natural spawning occurs below Merwin Dam and in Cedar Creek. Escapement has averaged 662 from 1980-1996 (Myers et al. 1998). Due to poor trapping efficiency at Lewis River Hatchery, it is possible that a large portion of the natural spawners are hatchery strays (Hymer et al.1992). Genetically, Lewis River Hatchery spring chinook salmon are intermediate between ocean type spring chinook from the Cowlitz and Kalama River hatcheries and stream type Klickitat Hatchery spring chinook salmon (Marshall et al. 1995, Myers et. al 1998).

Broodstock Source	Origin	Year(s) Used	
		Begin	End
Cowlitz River Spring Chinook	H	1967	1970
Carson National Fish Hatchery Spring Chinook	H	1960	1984
Kalama River Spring Chinook	H	U	U
Willamette River Spring Chinook (100% Marked and Returning Adults Not Used)	H	1986	1986
Lewis River Spring Chinook	H	1960	Present

6.2.2 Annual size.

The run size to the Lewis Subbasin (hatchery plus spawning grounds) has ranged from 1116-2741 over the period of 1990 through 2001. (Average = 1795). WDFW has established an egg take goal of 1.6 million eggs in the Future Brood Document (FBD). To meet this goal a total of 400 females and 400 males need to be collected annually, based on an average fecundity of 4400 eggs/female and pre-spawning mortality of 10%.

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

Currently, only marked fish are used in broodstock collection. However, with integration of this program, an as yet undetermined number of wild (adipose present) chinook will be used for broodstock.

The native component of the stock may have been extirpated or largely replaced by introduced hatchery stocks (Myers 2002). The hatchery component has received more out-of -basin introductions than the Cowlitz or Kalama hatchery spring chinook broodstocks. The Lewis River Hatchery broodstock was originally taken from Cowlitz and Carson National Fish Hatchery stocks in the 1970s. Since then, this stock has been propagated largely from returns to the hatchery; however, eggs and adults have been brought in from Kalama and Willamette (Oregon) hatchery stocks (the Willamette stock was differentially marked and was not used for broodstock upon return).

6.2.4 Genetic or ecological differences.

Lewis spring chinook are genetically similar to, but distinct from, Kalama Hatchery and Cowlitz Hatchery spring chinook stocks and all other Columbia River spring chinook stocks (WDF and WDW 1993).

6.2.5 Reasons for choosing.

The stock has a run entry pattern and timing that provides harvest opportunities for fisheries in the Lewis River subbasin, the lower Columbia mainstem/tributaries, Washington/Oregon Coast. The present naturally spawning spring chinook population in the Lewis River is composed primarily of hatchery returns, and as a result, most naturally spawning chinook are likely hatchery strays (WDFW SaSI 2002).

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 spring chinook population and out of basin hatchery transfers of eggs or fish for use as broodstock will only be considered in extreme cases.
- Integrating natural spawners will represent the existing spring chinook run through out the season.
- Hatchery program fish are mass marked.
- There are no known genotypic, phenotypic, or behavioral differences between either the hatchery stock or natural stock in the subbasin.
- Holding pond procedures follow IHOT guidelines.
- Other listed fish will be released immediately if encountered during the broodstock selection process.

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

Lewis River Hatchery Trap - The Lewis trap utilizes a denil ladder using both first run river water (75%) and hatchery effluent water (25%) as attractant. Upon reaching the top of the ladder the fish pass through a V weir into a channel 200 ft. long and 7 ft. wide, this channel has a good flow rate of fresh water, a automatic crowder system and a sorting brail.

Merwin Dam Trap-The Merwin trap is located at the base of Merwin Dam it has a one jump opening to the orifice opening into a V weir inlet. The fish enter into a darkened single chamber approximately 60 ft. long, 12 ft. wide and 7 ft. deep.

Adults arrive in early April and peak in May, June and July. Representative broodstock are held on station through the summer until maturation in September.
Proposed Integration – Starting with 2005 brood, WDFW will integrate natural spring chinook into the broodstock at a yet to be determined level.

7.3 Identity.

Spring chinook are identified by run timing. Since 2002, all hatchery-origin spring chinook have been mass marked (adipose-fin clip only). There are two groups of CWT'd fish. One receives 75,000 CWT only, the other 75,000 Ad + CWT, respectively.

7.4 Proposed number to be collected:

7.4.1 Program goal (assuming 1:1 sex ratio for adults):
800 adults (400 females and 400 males).

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	400	400	20
1992	307	204	1
1993	364	224	4
1994	357	223	4
1995	362	272	3
1996	403	306	5
1997	407	379	3
1998	497	498	2
1999	365	394	40
2000	417	330	7
2001	419	280	14

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

Excess hatchery-origin fish are recycled to the lower river for recreational opportunity one time. Those fish recycled are identified by marking. The second time they are captured, they are killed and provided to tribal or local food bank programs.

7.6 Fish transportation and holding methods.

All fish collected at the two traps are inoculated with erythromycin (for BKD) and then transferred to the Speelyai Hatchery for holding. During the holding period they are inoculated twice more with erythromycin. The pond is supplied with 100% first run Speelyai Creek water. Daily one hour standard formalin drip treatments are made to combat fungus problems. Yearly holding mortality is approximately 5%, which is within a targeted objective of less than 7%. In hauling adults, we generally use two trucks with 1,100 gallon tanks attached. A normal hauling load is approximately 700 pounds of fish, which translates to 45 fish or less per load. These fish remain in the tank for approximately 20-25 minutes between the capture point and the Speelyai pond. These fish handle and haul extremely well with mortality being extremely rare. There is no application of anesthetics or salves required.

Equipment Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Tanker Truck (2)	1800	Y	N	20	nya	nya
Tanker Truck (1)	1100	Y	N	20	nya	nya

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
1	Adult Holding/Sorting Pond (Asphalt)	42000	140	60.0	5.0	2500-6000

7.7 Describe fish health maintenance and sanitation procedures applied.

During the holding period they are inoculated twice with erythromycin. The pond is supplied with 100% first run Speelyai Creek water. Daily one hour standard formalin drip treatments are made to combat fungus problems. 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.

7.8 Disposition of carcasses.

Carcasses are disposed of at a landfill (due to inoculation).

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 spring chinook population and out of basin hatchery transfers of eggs or fish for use as broodstock will only be considered in extreme cases.
- Spring chinook will be collected through out the run time from adults arriving at the hatchery rack.
- Additional natural spring chinook are presumed to spawn downstream of the hatchery.
- Broodstock collection and sorting procedures can quickly identify non-target listed fish if encountered. Fish not used in the program are released immediately.

Section 8. Mating

8.1 Selection method.

Spawners are selected randomly over the entire run from fish arriving at both traps. Numbers set aside represent that percentage of the total run that is collected during that particular sorting period.

8.2 Males.

A ratio of one male to one female (1:1). Jacks may be included at a 2% rate.

8.3 Fertilization.

For all egg takes we use a one fish pool of eggs and 2 males. One male's sperm is provided as a primary and then later another males sperm is provided as backup. We incorporate 2% jack sperm over the entire days egg take. Fish health procedures used for disease prevention include water hardening of all eggs in an iodophor solution for one hour. We also do a sixty fish sample for ovarian fluid and kidney/spleen samples to test for viral pathogens. Agency spawning guidelines are closely followed (Seidel, 1983).

8.4 Cryopreserved gametes.

Cryopreserved gametes are 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.

- Limit out of basin transfers of fish or eggs for use as broodstock, except in rare circumstances.
- Listed spring chinook will be collected through out the run time from adults arriving at the hatchery rack.
- Mating cohorts are randomly selected
- WDFW protocols for population size, egg disinfection and spawning 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.

Year	Egg Take	Green-Eyed Survival (%)	Eyed-Ponding Survival (%)	Egg Survival Perfor-mance Std.	Fry-fingerling Survival (%)	Rearing Survival Perfor-mance Std.	Fingerling-Smolt Survival (%)
1990	U	U	U	nya	97.66	nya	99.64
1991	U	U	U	nya	95.44	nya	89.30
1992	757200	U	U	nya	98.9	nya	97.50
1993	1543600	U	U	nya	98.00	nya	99.20
1994	1563300	95.20	96.50	nya	91.40	nya	95.60
1995	1522000	96.14	99.73	nya	97.30	nya	98.60
1996	1612000	95.38	99.43	nya	96.50	nya	93.70
1997	1696000	91.37	99.69	nya	87.80	nya	95.70
1998	1990000	93.58	99.68	nya	95.70	nya	82.70
1999	1460000	94.21	99.60	nya	98.40	nya	98.50
2000	1579630	97.04	99.56	nya	96.10	nya	96.60
2001	1373232	95.70	98.90	nya	97.96	nya	nya

9.1.2 Cause for, and disposition of surplus egg takes.

Egg takes are planned according to data/information of historical egg takes at the Lewis River Complex. Thus, egg takes 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 and destroyed for unacceptable levels of BKD and with any other protocols involved due to viral sampling results (IHN). Otherwise, the program broodstock collection goal set forth in the annual brood document usually prevents surpluses.

At the time the fish are marked and enumerated, if any excess exists, they are released into Merwin Reservoir.

9.1.3 Loading densities applied during incubation.

Heath stack incubators are used for this stock. Incubation conditions are consistent with loading densities recommended by Piper et al. (1982). Water is supplied by the Lewis River for all eggs to eye stage, water quality is generally very good but water temperatures are quite cold (40 degrees) during incubation and into the early rearing period. Stack flows during incubation are 3.6 gpm. Eggs are treated with formalin at 600 ppm to keep them free of fungus. Eggs after water hardening are approximately 1,350 eggs per pound.

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 a spring source 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%. Gas levels at Speelyai have never been an issue but incoming water is periodically monitored to check the total gas levels. Water quality is good with no apparent silt problems.

9.1.5 Ponding.

Fry are ponded when: a visual inspection of the amount of yolk sac remaining with the yolk slit closed to approximately 1 millimeter wide (approximately 1200 TU's) or based on (95% yolk absorption) KD factor. At this time fry are transferred to the appropriate starter raceway (See HGMP Section 5.5 for raceway specifications). Ponding takes place in December through early January.

9.1.6 Fish health maintenance and monitoring.

Fish Health Monitoring	A fish health specialist inspects fish programs at Lewis Complex monthly and checks both healthy and if present symptomatic fish and eggs.
Disease Treatment	All eggs are water hardened in iodophor solution. Formalin is used to control fungus outbreaks. Egg mortality at Lewis River Hatchery and Speelyai Hatchery is generally well within our objectives with most mortality due to lack of fertilization or high water temperature. Historic averages for both programs on this stock would be <8% loss each year. All disease control procedures are conducted consistent with our Agencies disease policy. Egg information is recorded on standardized agency forms that are forwarded to Olympia monthly. Fish health and or treatment reports are kept on file.
Egg Disposal	Dead/undeveloped eggs are frozen and disposed in local landfill. If eggs are disease-free, they could be placed in designated tributaries for nutrient enhancement
Sanitation	All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy). All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots. Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water. Tank trucks are disinfected between the hauling of adult and juvenile fish. Footbaths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

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 followed.
- Multiple units are used in incubators.
- Splash curtains can isolate incubators.
- Temperature, dissolved oxygen, and flow are monitored.
- Dead eggs are discarded in a manner that prevents transmission.

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 (%)	Egg Survival Perfor-mance Std.	Fry-fingerling Survival (%)	Rearing Survival Perfor-mance Std.	Fingerling-Smolt Survival (%)
1990	U	U	U	nya	97.66	nya	99.64
1991	U	U	U	nya	95.44	nya	89.30
1992	757200	U	U	nya	98.9	nya	97.50
1993	1543600	U	U	nya	98.00	nya	99.20
1994	1563300	95.20	96.50	nya	91.40	nya	95.60
1995	1522000	96.14	99.73	nya	97.30	nya	98.60
1996	1612000	95.38	99.43	nya	96.50	nya	93.70
1997	1696000	91.37	99.69	nya	87.80	nya	95.70
1998	1990000	93.58	99.68	nya	95.70	nya	82.70
1999	1460000	94.21	99.60	nya	98.40	nya	98.50
2000	1579630	97.04	99.56	nya	96.10	nya	96.60
2001	1373232	95.70	98.90	nya	97.96	nya	nya

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 on-site, life-stage specific survival studies conducted at other facilities and staff experience (e.g. trial and error). The pond loading densities maintained at both hatcheries for both programs are consistent with those recommended by Piper et al. (1982). We closely monitor pounds of fish, water temperatures and water flows and adjust where needed.

9.2.3 Fish rearing conditions.

Total gas levels are carefully monitored and if they were to exceed acceptable levels, the water is routed through the degassing towers to reduce the gas concentrations to levels compatible to good fish rearing conditions. Environmental parameters: flow rates, water temperatures, dissolved oxygen and Total Settable Solids (TSS) are monitored on a routine basis throughout the rearing period. Influent dissolved gas levels are a problem at the Lewis River Hatchery. Since Lewis River is located below four hydroelectric generation facilities, the water system is closely watched and monitored at all times. Lewis River Hatchery is equipped with four de-gassing towers that have proved to be very efficient in treating incoming water with high total gas levels. Gas levels at Speelyai have never been an issue but influent is periodically monitored to check the total gas levels. 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	Hepatosomatic Index	Body Moisture Content
04/02/01	84.4	89.0	U	nya	nya	nya
05/26/01	U	54.6	U	0.364	nya	nya
06/32/01	102.8	44.1	1.035	0.192	nya	nya
07/21/01	U	37.1	U	0.159	nya	nya
08/18/01	U	32.4	1.130	0.127	nya	nya
09/22/01	116.4	22.6	U	0.303	nya	nya
10/27/01	U	17.4	U	0.230	nya	nya
11/24/01	U	14.0	1.189	0.195	nya	nya
12/22/01	150.3	12.1	U	0.136	nya	nya
01/19/02	U	10.4	1.206	0.141	nya	nya
02/23/02	184.0	8.61	1.188	0.172	nya	nya
03/23/01	U	7.7	U	0.106	nya	nya

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

Same as above, see section 9.2.4.

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

Rearing Period	Food Type	Application Schedule (#feedings/day)	Feeding Rate Range (%B.W./day)
Ponding-450 fpp	Moore Clark Nutra #0	nya	nya
450-225 fpp	Moore Clark Nutra #1	nya	nya
225-130 fpp	Moore Clark Nutra #2	nya	nya
130-90	Moore Clark Fry 1.2	nya	nya
90-45 fpp	Moore Clark Fry 1.5	nya	nya
45 – 30fpp	Moore Clark Fry 2.0	nya	nya
30 – 10 fpp	Moore Clark Fry 2.5		

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 Lewis River Complex monthly and checks both healthy and if present, symptomatic fish. Based on pathological or visual signs by the crew, age of fish and the history of the facility, the pathologist determines the appropriate tests. External signs such as lesions, discolorations, and fungal growths will lead to internal examinations of skin, gills and organs. Kidney and spleen are checked for bacterial kidney disease (BKD). Blood is checked for signs of anemia or other pathogens. Additional tests for virus or parasites are done if warranted.
Disease Treatment	As needed, appropriate therapeutic treatment will be prescribed to control and prevent further outbreaks. Erythromycin treatments during the rearing period as needed. Saprolegniasis occurrences in young hatchery fish have been observed in greater frequency on Mitchell Act stations having nutrient enhancement projects. In some cases, circumstantial evidence suggests more outbreaks of gill and tail fungus are the result of nutrient enhancement efforts as well. Staff is continuing to monitor observations or occurrences of this possibility. Mortality is collected and disposed of at a landfill. Fish health and or treatment reports are kept on file.
Sanitation	All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy). All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots. Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water. Tank trucks are disinfected between the hauling of adult and juvenile fish. Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

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

The migratory state of the release population is noticeable by fish behavior. Aggressive screen and intake crowding, swarming against sloped pond sides, leaner condition factors, a more silvery physical appearance and loose scales during feeding events are signs of smolt development that can be observed by staff. Multiple smolt events can also be triggered by environmental cues including daylight increase, a spike in the water temperature and spring freshets. ATPase activity is not measured.

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

Not applicable.

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.

- Limit out of basin transfers of fish or eggs for use as broodstock, except in rare circumstances.
- At least 800 adults are available in the population.
- Listed spring chinook 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 Watershed	Eco-province
Yearling	900,000	10 FPP	March	North Fork Lewis River	20.9	Lewis	Lower Columbia

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

Same as above, see section 10.1

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

	Fry Release			Fingerling Release			Yearling Release		
Release Year	No.	Date (MM/DD)	Avg size (fpp)	No.	Date (MM/DD)	Avg Size (fpp)	No.	Date (MM/DD)	Avg Size (fpp)
1991	nya	nya	nya	nya	nya	nya	nya	nya	nya
1992	nya	nya	nya	nya	nya	nya	916100	March 12-22	9.0
1993	nya	nya	nya	nya	nya	nya	919000	February 25 and March 24	7.5 and 13.0
1994	nya	nya	nya	nya	nya	nya	642000	March 5	7.0
1995	nya	nya	nya	nya	nya	nya	1312600	February 12-March 20	6.0
1996	nya	nya	nya	nya	nya	nya	1178272	February 8-March 22	6.0
1997	nya	nya	nya	nya	nya	nya	1108045	February 14-March 23	6.0
1998	415124	October 27	1400	nya	nya	nya	1096841	January 1-March 28	6.5
1999	196434	November 30 and December 20	1100 and 1200	159706	March 5-17 and July 23	166-259 and 54	868180	February-March	8.5
2000	nya	nya	nya	nya	nya	nya	1045056	February-March	5.1-7.6
2001	nya	nya	nya	290100	March 27-April 2	100	924115	February-March	5.3-6.2
2002	nya	nya	nya	nya	nya	nya	1013814	February-March	8.4-7.6
Avg	nya	nya	nya	nya	nya	nya	nya	nya	nya

10.4 Actual dates of release and description of release protocols.

Volitional on-site releases occur from February 22 to March 31. Release strategies are to ensure that hatchery fish migrate from the hatchery/release site with a minimal amount of interaction with native fish populations. Yearly seining is conducted by WDFW staff to collect data in an effort to evaluate the success of our release strategy and to provide data for improvement.

10.5 Fish transportation procedures, if applicable.

Equipment Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Tanker Truck (2)	1800	Y	N	20	nya	nya
Tanker Truck (1)	1100	Y	N	20	nya	nya

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

100% of this program is mass marked (adipose fin clip) with the exception of 75,000 that are CWT only and a second group of 75,000 that is Ad +CWT.

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

Egg takes are planned according to data/information of historical egg takes at the Elochoman Hatchery. Thus, egg take 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 appropriate WDFW Regional Manager to apprise him/her of the situation. Regional Manager would consult with appropriate regional co-managers/NOAA to get recommendation for fish disposition. The Hatchery Complex Manager would instruct hatchery to implement recommendation. At the time the fish are marked and enumerated, if any excess exists, they may be released into Merwin Reservoir.

10.9 Fish health certification procedures applied pre-release.

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

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

Emergency procedures and disposition of fish would adhere to the protocols and procedures set forth in the Program Section 7 Permit protocols. If an emergency release were authorized, fish would be released accordingly to procedures and methods that assure the highest probability of fish surviving to adulthood. In a case of no authorization for release, the procedures would be implemented to minimize catastrophic loss if fish were held at hatchery.

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.

- Volitional on-site releases occur from February 22 to March 31. Release strategies are to ensure that hatchery fish migrate from the hatchery/release site with a minimal amount of interaction with native fish populations.
- Yearly seining is conducted by WDFW staff to collect data in an effort to evaluate the success of our release strategy and to provide data for improvement.
- The production and release of only smolts through fish culture and volitional release practices fosters rapid seaward migration with minimal rearing of delay in the rivers, limiting interactions with naturally produced steelhead juveniles.
- WDFW uses acclimation and release of smolts in lower river reaches where possible, this in an area below known wild fish spawning and rearing habitat.
- WDFW proposes to continue monitoring, research and reporting of hatchery smolt migration performance behavior, and intra and interspecific interactions with wild fish to access, and adjust if necessary, hatchery production and release strategies to minimize effects on wild fish.
- WDFW fish health and operational concerns for Lewis River Hatchery programs are communicated to WDFW Region 5 staff for any risk management or needed treatment. See also section 9.7.

Section 11. Monitoring and Evaluation of Performance Indicators

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

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.

To evaluate hatchery programs comprehensive monitoring and evaluation programs are needed. These programs at a minimum must measure adult hatchery and wild escapement, and fishery contributions from hatchery and wild salmonids for every stock. Reproductive success should be measured for representative wild and hatchery stocks. Ecological interactions (predation, competition, and disease) need to be measured for representative stocks as well. See section 1.10.

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 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.

Monitoring, evaluation and research follow scientific protocols with adaptive management process if needed. WDFW will take risk aversion measures to eliminate or reduce ecological effects, injury, or mortality as a result of monitoring activities. Most trap mortalities are the result of extreme environmental conditions that flood traps or equipment failure. WDFW will take precautions to make sure the equipment is properly functioning during the season. If environmental conditions are forecast that will cause high mortality then traps will be removed or opened up to allow unobstructed passage without mortality. Any take associated with monitoring activities is unknown but all follow scientific protocols and “Best Practices” designed to minimize impact.

Section 12. Research

12.1 Objective or purpose.

1) Measure fecundity of spring chinook salmon at Speelyai Hatchery each year to determine temporal changes.
2) Compare these data to calculate fecundities obtained from hatchery records
3) Compare these data to data obtained at other Columbia Basin hatcheries.

12.2 Cooperating and funding agencies.

National Marine Fisheries Service (NMFS) and Washington Department of Fish & Wildlife (WDFW)

12.3 Principle investigator or project supervisor and staff.

Jim Byrne
Fish & 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 are used in this research project.

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

Lengths of individual females are taken. Age is determined from coded-wire tags or scales (if not tagged). Fecundity is determined by passing the eggs through an electronic fish counter. The accuracy of the fish counter is greater 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 o f eggs are counted and the lot of eggs is placed 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.

No mortality to adults due to activity. Unfertilized eggs are usually identified by the mechanical shock received in the process. Live eyed eggs are unharmed.

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).

Section 13. Attachments and Citations

13.1 Attachments and Citations

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Section 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

14.1 Certification Language and Signature of Responsible Party

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

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

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

Spring Chinook

ESU/Population	Lower Columbia River Spring Chinook
Activity	Lewis River Spring Chinook
Location of hatchery activity	Lewis River Hatchery, Merwin Hatchery, and Echo Cove Net Pens
Dates of activity	May - September
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	800	nya
Intentional lethal take (f)	nya	nya	800	nya
Unintentional lethal take (g)	120,000*	108,000**	nya	nya
Other take (specify) (h)	nya	nya	nya	nya

* Loss based on 10% from egg to fry, loss based on 10% fry to smolt.
a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

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

Fall Chinook

ESU/Population	Lower Columbia River Fall Chinook
Activity	Lewis River Spring Chinook
Location of hatchery activity	Lewis River Hatchery, Merwin Hatchery, and Echo Cove Net Pens
Dates of activity	May - September
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 (indirect, unintentional) (h)	nya	unk	nya	nya

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.

Steelhead

ESU/Population	Lower Columbia River Steelhead
Activity	Lewis River Spring Chinook
Location of hatchery activity	Lewis River Hatchery, Merwin Hatchery, and Echo Cove Net Pens
Dates of activity	May - September
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 (unintentional, indirect) (h)	nya	unk	nya	nya

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

ESU/Population	Lower Columbia River Coho
Activity	Lewis River Spring Chinook
Location of hatchery activity	Lewis River Hatchery, Merwin Hatchery, and Echo Cove Net Pens
Dates of activity	May - September
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 (unintentional, indirect) (h)	nya	unk	nya	nya

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