HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	East Fork Lewis River-Skamania Hatchery Winter Steelhead Outplant
Species or Hatchery Stock	Winter Steelhead (*Oncorhynchus mykiss)* Skamania Hatchery Winter Steelhead stock
Agency/Operator	Washington Department of Fish and Wildlife
Watershed and Region	Lewis Subbasin/Lower Columbia Province
Date Submitted	nya
Date Last Updated	August 17, 2004

Section 1: General Program Description

1.1 Name of hatchery or program.

East Fork Lewis River-Skamania Hatchery Winter Steelhead Outplant

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

Winter Steelhead (*Oncorhynchus mykiss*)

ESA Status: Not listed and not a candidate for listing

1.3 Responsible organization and individuals.

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

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

Clark Public Utility, through a MOU, provides funds and facilities for partial rearing of Skamania winter steelhead.

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

Funding Sources
Mitchell Act

Operational Information	Number
Full time equivalent staff	4
Annual operating cost (dollars)	$463,581.00

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

1.5 Location(s) of hatchery and associated facilities.

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

1.6 Type of program.

Isolated Harvest

1.7 Purpose (Goal) of program.

- Rear and release up to 90,000 smolts into the E.F. Lewis River system.
- The goal is to mitigate for activities within the Columbia River basin, which has reduced salmonid populations.
- The purpose is to provide maximum sport harvest under the selective fishery regulations (retention of adipose-clipped fish only) while eliminating a directed harvest on wild winter steelhead.

For programs designed for selective steelhead harvest, WDFW tries to minimize natural escapement of hatchery fish to protect the genetic diversity of wild stocks and minimize impact on listed fish. The first most commonly used approach for steelhead management is to maximize the difference between hatchery and wild stocks, so that if hatchery fish spawn, they are not likely to interbreed with wild spawners. Strategies used by WDFW to limit genetic and ecological risks include these actions: 1) limit the number of hatchery spawners by providing intense selective fisheries, and maintaining high trapping efficiency at the hatcheries or adult traps that remove hatchery fish prior to spawning; 2) advance the spawning timing of Chambers Creek and Skamania type steelhead stocks, so these fish spawn three months earlier than wild stocks, minimizing interbreeding between these two groups; 3) keep hatchery steelhead spawners in the lower river away from prime wild steelhead spawning areas through lower river releases and acclimation; 4) since the reproductive success of Chambers Creek stock is 11% of wild winter steelhead and Skamania Stock is 18% of wild summer steelhead, the few fish that do survive to spawn will produce few offspring; 5) use hatchery management practices, acclimation, timing, and lower river releases to limit steelhead residualism and the competition and predation that can occur when steelhead smolts residualize; and 6) follow the Integrated Hatchery Operations Team (IHOT 1995) guidelines to limit disease risks from hatchery steelhead.

1.8 Justification for the program.

- The program is authorized under the Columbia River Fisheries Development Program,

Columbia River Fish Management Plan and U.S. vs. Oregon.

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

In order to minimize impact on listed fish by WDFW facilities operation and the E.F.Lewis winter steelhead program, the following Risk Aversion are included in this HGMP:

Table 1. Summary of risk aversion measures for the E.F.Lewis winter steelhead program.

Potential Hazard	**HGMP Reference**	**Risk Aversion Measures**
Water Withdrawal	4.2	This is a direct plant to the system. These potential hazards are covered in the Skamania Winter Steelhead HGMP as the originating station.
Intake Screening	4.2	
Effluent Discharge	4.2	
Disease Transmission	7.9, 10.11	*Fish Health Policy in the Columbia Basin*. Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).
Competition & Predation	See also 2.2.3, 10.11	Current risk aversions and future considerations are being reviewed and evaluated for further minimizing impacts to listed fish.

1.9 List of program "Performance Standards".

See 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 catch of 1049 adult 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. Maintain effective population size	A minimum of 400 adults are collected throughout the spawning run in proportion to timing, age and sex composition of return	Annual run timing, age and sex composition and return timing data are collected. Adhere to WDFW spawning guidelines. (WDFW 1983)
Region-wide, groups are marked in a manner consistent with information needs and protocols to estimate impacts to natural and hatchery origin fish	Use mass-mark (adipose-fin clip) for selective fisheries only	Returning fish are sampled throughout their return for length, sex, mark and
Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens. Follow Co-managers Fish Health Disease Policy (1998).	Necropsies of fish to assess health, nutritional status, and culture conditions	WDFW Fish Health Section inspect adult broodstock yearly for pathogens and 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 pathogens and parasites	1 to 6 weeks prior to transfer or release, fish are examined in accordance with the Co-managers Fish Health Policy
	Inspection of adult broodstock pathogens and parasites	At spawning, lots of 60 adult broodstock are examined for pathogens
	Inspection of off-station fish/eggs prior to transfer to hatchery pathogens and parasites	Controls of specific fish pathogens through eggs/fish movements are conducted in accordance to Co-managers Fish Health Disease Policy.

1.10.1 Risks:

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Minimize impacts and/or interactions to ESA listed fish	Hatchery operations comply with all state and federal regulations. Hatchery juveniles are raised to smolt-size (5.0-5.5 fish/lb) and released from the hatchery at a time that fosters rapid migration downstream. Mass mark production fish to identify them from naturally produced fish	As identified in the HGMP: Monitor size, number, date of release and mass mark quality. Additional WDFW projects: straying, instream evaluations of juvenile and adult behaviors, NOR/HOR ratio on the spawning grounds, fish health documented.
Artificial production facilities are operated in compliance with all applicable fish health guidelines, facility operation standards and protocols including IHOT, Co-managers Fish Health Policy and drug usage mandates from the Federal Food and Drug Administration	Hatchery goal is to prevent the introduction, amplification or spread of fish pathogens that might negatively affect the health of both hatchery and naturally reproducing stocks and to produce healthy smolts that will contribute to the goals of this facility.	Pathologists from WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed
Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring	NPDES permit compliance WDFW water right permit compliance	Flow and discharge reported in monthly NPDES reports.
Water withdrawals and instream water diversion structures for hatchery facility will not affect spawning behavior of natural populations or impact juveniles.	Hatchery intake structures meet state and federal guidelines where located in fish bearing streams.	Barrier and intake structure compliance assessed and needed fixes are prioritized.
Hatchery operations comply with ESA responsibilities	WDFW completes an HGMP and is issued a federal and state permit when applicable.	Identified in HGMP and Biological Opinion for hatchery operations.
Harvest of hatchery-produced fish minimizes impact to wild populations	Harvest is regulated to meet appropriate biological assessment criteria. Mass mark juvenile hatchery fish prior to release to enable state agencies to implement selective fisheries.	Harvests are monitored by agencies and tribes to provide up to date information.

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

Not applicable. See Washougal/Skamania Winter Steelhead HGMP

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

Age Class	Max. No.	Size (ffp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Water-shed	Eco-province
Yearling	90000	5.5	April 15-May 15	East Fork Lewis River	10.2 & 14.4	Lewis	Lower Columbia

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

Fish are released for harvest only and no escapement is intended for this program. Average release was 111,154 smolts and annual average catch was 1,049 steelhead (WDFW Historical database). Adults are not collected at this location.

Return Year	Sport Harvest Hatchery	Smolt Release
1990/91	1,036	93,100
1991/92	1,901	141,700
1992/93	2,714	104,400
1993/94	882	140,700
1994/95	1,350	120,200
1995/96	647	135,200
1996/97	314	105,200
1997/98	163	106,600
1998/99	554	100,900
1999/00	896	125,100
2000/01	439	90,000
2001/02	2,149	91,300
2002/03	591	90,600
2003/04	Na	Na

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

Plants of steelhead to the Lewis River system have been ongoing since 1954.

1.14 Expected duration of program.

The program is on-going with no planned termination.

1.15 Watersheds targeted by program.

E.F. Lewis Subbasin/Lower Columbia Province

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

1.1.6.1 Brief Overview of Key Issues:

The sole purpose of the release of Skamania stock winter steelhead into the EF Lewis is to continue a winter steelhead sport fishery while eliminating a directed harvest on wild winter steelhead. Smolts are released at the upper end of Lewisville Park (Rkm 14.4) and at Daybreak Park (Rkm 10.2) to discourage migration into the upper river and encourage them to remain in the heart of the sport fishery so that they are highly susceptible to harvest. Any adults that escape the fishery may spawn in the system, but a series of falls on the upper EF Lewis provides a measure of separation between these hatchery steelhead and the main spawning area of the wild winter steelhead.

1.1.6.2 Potential Alternatives to the Current Program:

Alternative 1: Eliminate the non-local program and use the native stock for this program. WDFW is currently involved in a research project on the Kalama River that will provide information on the feasibility of using the native population. This alternative would require

utilizing the local stock, which could not occur without better knowledge of the condition of the wild stock.

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

1.16.3 Potential Reforms and Investments:

Reform/Investment 1: If the local stock were to be used for this program, new rearing facilities and heated water systems would be needed to produce 1-year smolts from the entire run time. The cost to perform such a modification is currently estimated to be in the range.

Reform/Investment 2: If the local stock were to be used for this program, new trapping facilities would be needed to acquire broodstock and maintain an integrated population. Costs for such construction are currently estimated to be in the range.

Reform/Investment 3: If the local stock were to be used for this program, monitoring and evaluation will be needed to insure that the survival of the native population is not impacted and to decrease the risk of impacting other ESA listed species. Costs for monitoring and evaluation are currently estimated to be in the range.

Section 2: Program Effects on ESA-Listed Salmonid Populations

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

WDFW is writing HGMP's to cover all stock/programs produced at Washougal and Skamania Hatcheries including; fall Chinook, coho, summer and winter run steelhead. No ESA permits or authorizations exist for the locally adapted broodstock program identified in this HGMP. This HGMP will be submitted to the National Marine Fisheries Service for ESA review and approval.

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

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

ESA listed stock	Viability	Habitat
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	Na	Na
H, M and L refer to high, medium and low ratings, low implying critical and high healthy.		

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

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

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

Identify the ESA-listed population(s) that may be incidentally affected by the program.
Lower Columbia River spring chinook salmon *(Oncorhynchus tshawytscha)* within the Evolutionary Significant Unit (ESU) are federally listed as "threatened" under the Endangered Species Act effective May 24, 1999.
Lower Columbia River fall chinook salmon *(Oncorhynchus tshawytscha)* are federally listed as "threatened" under the Endangered Species Act. Coweeman, Cowlitz and Toutle Populations.
Lower Columbia River Steelhead *(Oncorhynchus mykiss),* were listed as threatened under the ESA on March 19, 1998.
Lower Columbia River Coho *(Oncorhynchus kisutch)* is currently a candidate for listing but has been 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 fall chinook salmon *(Oncorhynchus tshawytscha)* 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 defined stocks of fall chinook that return to the Columbia River. These include the lower river hatchery (LRH), lower river wild (LW , Bonneville Pool Hatchery (BPH) and the upriver brights (ml l The North Lewis wild fall chinook represent about 80 percent to 85 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 2. Fall chinook salmon abundance estimates in the LCMA.

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

Lower Columbia River spring chinook salmon *(Oncorhynchus tshawytscha)*

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 is 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. Natural escapement of adult fish, based on annual spawning

ground counts, 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 averages only a few hundred adults annually because of poor trapping efficiency. Early attempts to save the native population through hatchery production failed, and by the 1950's spring chinook runs in both the Lewis and Kalama rivers had been reduced to only remnant populations. In 1951, Washington Department of Fisheries estimated the escapement of spring chinook in the Lewis River at only 100 fish (WDF 1951). Nearly all of the spawning on the Lewis River occurs in a 4-mile reach from Merwin Dam downstream to the Lewis River hatchery (WDF/WDW 1993). Hatchery programs for spring chinook were established at Kalama Falls Hatchery after its completion in 1959 and at Speelyai and Lewis River hatcheries beginning in 1971. The Lewis River naturally spawning spring chinook population was considered healthy based on escapement trend (WDF/WDW 1993). However, Myers et al. (1998) indicate the possibility that the native Lewis River spring chinook run is extinct, and the observed stock has undergone extensive hybridization. This information conflicts with the 1993 SASSI report (WDF/WDW 1993) that lists the Lewis River spring Chinook stock as native (Table 1). Additional information is needed to determine the stock origin and recent stock status for Lewis River spring chinook (Rawding 1999, personal communication). Natural spawn escapement from 1980-1991 has averaged 2,194 with a low of 345 in 1981 and a peak of 6,939 in 1987. Only occasional stray spring chinook return to the East Fork Lewis (WDF/WDW 1993).

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

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

Lower Columbia River steelhead *(Oncorhynchus mykiss*), were listed as threatened under the ESA on March 19, 1998. In Washington, the LCR steelhead ESU includes winter and summer steelhead in tributaries to the Columbia River between the Cowlitz River and Wind River. As partial mitigation for the lost spawning and rearing habitat, state hatcheries began planting winter steelhead smolts in the Lewis in 1954 (WDFW 1998, vol. 1 appendices). The Lewis River winter steelhead stocks are now composed of both wild and hatchery stocks. Lucas (1985- in WDFW 1998, vol. 1 appendices) estimated that from 1973-1984, 56% of the winter steelhead returns to the East Fork Lewis were of wild origin. More recent data from the Lower Columbia Steelhead Conservation Initiative (LCSCI 1998) estimates that 51% of the spawning winter steelhead in the East Fork are of hatchery origin (see Table 5). WDF (1990) estimated that only 6% of the returning winter steelhead to the North Fork Lewis are wild fish. The East Fork Lewis River winter-run steelhead is of mixed hatchery and native origin. To provide fishing opportunities, approximately 100,000 hatchery-origin smolts are planted annually. The winter-run steelhead stocks in both the East and North Lewis Rivers are identified as depressed by the WDFW (LCSCI 1998). 1973-1984, 56% of the winter steelhead returns to the East Fork Lewis were of wild origin. More recent data (LCSCI 1998) estimates that 51% of the spawning winter

steelhead in the East Fork are of hatchery origin. WDF (1990) estimated that only 6% of the returning winter steelhead to the North Fork Lewis are wild fish. The East Fork Lewis River winter-run steelhead is of mixed hatchery and native origin. To provide fishing opportunities, approximately 100,000 hatchery-origin smolts are planted annually. The winter-run steelhead stocks in both the East and North Lewis Rivers are identified as depressed by the WDFW (LCSCI 1998). The East Fork summer steelhead stock status was classified as unknown in the 1992 SASSI (WDF/WDW, 1993). With more recent information, East Fork summer steelhead are now considered "depressed" due to chronically low escapements. The East Fork Lewis River summer-run steelhead stock is primarily comprised of non-native (Skamania) hatchery origin fish, with some natural spawning (WDF 1990). The wild stock of North Fork summer steelhead is chronically low in abundance and rated as depressed due to loss of access to available habitat upstream of the dams. Wild summer steelhead returns account for less than 7% of the total North Fork run size (WDFW 1998, vol. 1 appendices). Due to low return of wild summer steelhead to the North Fork, no escapement goal has been established (LCSCI 1998).

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

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

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

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

Lower Columbia River Coho (*Oncorhynchus kisutch*) is currently a candidate for listing but has been 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 in the Lewis watershed are managed for hatchery production, but some returning fish will successfully use natural habitat (WDFW 1998, vol. 1 appendices). Cedar Creek is the most extensively used stream on the North Fork Lewis; with coho traveling 15 miles into tributaries like the North and South Forks of Chelatchie Creek (WDF 1973). Coho stock status in the North Fork Lewis is considered depressed based on a long-term decline in escapement (see Table 3) (WDF/WDW 1993). Historically, mainly late returning coho utilized the East Fork, while both late and early returning coho were found in the North Fork. SASSI (WDF/WDW 1993) lists East Fork coho stock status as depressed. The recent status of coho within the East Fork Lewis is unknown because of incomplete and inconsistent survey data; however, the limited information that is available suggests that the population is depressed (Shane Hawkins, pers. comm. 1999).

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

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

Broodstock Program:

Broodstock Collection: Broodstock are not collected at this location. Refer to Washougal/Skamania Winter Steelhead HGMP.

Genetic introgression: To reduce the number of hatchery fish that could interbreed with listed steelhead, WDFW uses a wild steelhead management strategy removing steelhead thru selective harvest. Strategies used by WDFW to limit genetic and ecological risks include these actions: 1) limit the number of hatchery spawners by providing intense selective fisheries, and maintaining high trapping efficiency at the hatcheries or adult traps that remove hatchery fish prior to spawning; 2) advance the spawning timing of Chambers Creek and Skamania type steelhead stocks, so these fish spawn three months earlier than wild stocks, minimizing interbreeding between these two groups; 3) keep hatchery steelhead spawners in the lower river away from prime wild steelhead spawning areas through lower river releases and acclimation; 4) since the reproductive success of Chambers Creek stock is 11% of wild winter steelhead and Skamania Stock is 18% of wild summer steelhead, the few fish that do survive to spawn will produce few offspring; 5) use hatchery management practices, acclimation, timing, and lower river releases to limit steelhead residualism and the competition and predation that can occur when steelhead smolts residualize. Indirect take from genetic introgression is unknown.

Rearing Program:

Operation of Hatchery Facilities: Not applicable as this is a direct plant to the E.F. Lewis River.

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 Washougal/Skamania Hatcheries. Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1994) chapter 5 have been instrumental in reducing disease outbreaks. When steelhead reach larger sizes (sub-yearling

phase to yearling phase), they have generally been problem free. Prior to release, the steelhead population health and condition is established by the Area Fish Health Specialist. This is commonly done 1-3 weeks pre-release and up to 6 weeks on systems with pathogen free water and little or no history of disease. Indirect take from disease is unknown.

Release:

Hatchery Production/Density-Dependent Effects: The current 90,000 smolt plant is a plant for steelhead programs in the Columbia system to achieve some meaningful harvest potential. Density effects are lessened when fish are transferred and planted in a smolted condition. 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:

- As discussed above, coho salmon and steelhead released from hatchery programs as smolts typically migrate rapidly downstream. The SIWG (1984) concluded that "migrant fish will likely be present for too short a period to compete with resident salmonids." On station release in large systems may travel even more rapidly – migration rates of approximately 20 river miles per day were observed by steelhead smolts in the Cowlitz River (Harza 1998).
- 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."
- 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."
- 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." Indirect take from competition is unknown.

Predation: Steelhead released 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 any studies that have been empirically estimated the predation risks to listed fish by this program. 'Predation by Juvenile Hatchery Salmonids on Wild Fall Chinook Fry in the Lewis River, Washington' and a number of documents in the PacifiCorp / Cowlitz PUD/Lewis River Hydroelectric Projects Technical Reports - FERC Project Nos. 935, 2071, 2111, 2213. In this study, coho, steelhead and sea-run cutthroat trout were found to prey on naturally produced chinook fry. Mean chinook fry per stomach sampled ranged from 0.05-0.11 for coho; 0.01-1.13 for steelhead; 0.00-2.13 for sea-run cutthroat. The authors also noted that:

- "Because data were not available on evacuation rates of fry consumed, hatchery smolt residency time by species, the number of wild chinook salmon fry each year, or their vulnerability over time, total fry consumed by hatchery smolts was not estimated".
- "The estimated mean number of chinook salmon fry consumed per hatchery smolt was much greater in the Lewis River than in upper Columbia River areas."
- "The substantial increase in predation rates in 1998 probably reflects an increase chinook fry abundance that year. Nearly 3 times more chinook fry appeared to be present in 1998 compared to 1997, based on similar seining effort, timing and sampling sites."
- Releases of hatchery sea-run cutthroat trout on the Lewis River will stop after the 1999 release, due to their consumption of wild chinook fry as smolts and their low return rates as adults."
- "This stock has remained relatively healthy while other lower Columbia River stocks have declined in the last decade."

Predation Risk Factors:

Environmental Characteristics: The E.F.Lewis River is a medium to large sized tributary merging with the N.F. Lewis River mainstem at approximately river mile 3.5, about 4,000 feet downstream of the I-5 Bridge. The EF Lewis River watershed is primarily a low to mid-elevation, rain dominated system with extensive rain-on-snow conditions present in the upper reaches. Peak stream flows are generated by fall, winter, and spring rains with flows augmented by snowmelt in the spring and early summer. Average flow range from a high of 2,000 cfs in mid-winter to a low of less than 100 cfs in late summer. Thru mid April, more than 1,000 cfs is available, with flows dropping during May and June to 600-400 cfs (adapted form Wade 2002). At the confluence of the N.F. Lewis River mainstem, additional flow and turbidity from the reservoirs can add glacial color to the system as well as being impacted with back tidal influence in the lower reaches (approximately 10 miles).

Dates of Releases: Steelhead smolts are released from mid-April to mid May. Staff has bee implementing release dates after May 1st with this window being as late as possible before operation commitments require release. Staff considers size, smolt condition and environmental conditions to determine the most optimal and safest release date for the program. Yearling programs close to release times are at the mercy of environmental conditions, and unforeseen problems such as high temperatures or unusual low water conditions could also require region staff to consider options as needed for the safety of the program from April to May.

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

Release Location and Release Type: The likelihood of predation may also be affected by the location and type of release. Other factors being equal, the risk of predation may increase with the length of time that involves co-mingling. In the freshwater environment, this is likely to be affected by distribution of the listed species in the watershed, the location of the release and the speed at which fish released from the program migrate. Steelhead migration rates of approximately 20 river miles per day have been observed in the Cowlitz River (Harza 1998). This study indicated that smolt releases from acclimation sites migrate faster than those made from one system to another. Although this is not the case for this direct plant, the larger size of a receiving system also was a determining factor in the study.

We have provided in this section a summary of empirical information an theoretical analysis of competition and predation interactions that may be relevant to the E.F.Lewis summer steelhead program.

Potential E.F.Lewis winter steelhead predation and competition effects on listed salmonids: The proposed annual production goal for this program is up to 25,000 fish at an average size of 5.0 fpp (approximately 210 mm fl). Fish are planted from mid-April to May 1st. Fish are released volitionally from mid-April to May 1st. In the past two years, staff has delayed fish releases until May. Implementing this later date will allow additional growth for listed Chinook. Steelhead released as actively migrating smolts would not likely compete for food or habitat with fingerling stocks of Chinook or steelhead. At 5.0 fpp, steelhead pose an unknown risk on listed fish of 69 mm fl and smaller. The magnitude of predation will depend upon the characteristic of the listed population of salmonids and the habitat in which the population occurs.

Relative Body Size: Steelhead releases average 5.0 fpp (210 mm fl). Below are some data available for chinook fry and fingerling lengths from area Lower Columbia streams. The current release poses a risk to fish less than 70 mm although as mentioned previously, the magnitude of predation will depend upon the characteristic of the listed population of salmonids and the habitat in which the population occurs. Indirect take due to predation is unknown.

- Lengths from the Lewis River system during the month of June indicate fish 48-55 mm fl. By race, fall or spring Chinook data could not be separated (Columbia River Progress Report 2003-16).
- Average fork length by week from 26 sampling sites on the Kalama River by week

indicate fish 44 mm fl on April 25, 46 mm fl on May 3, 56 mm fl on May 11, 62 mm fl by May 16, and ranges of 70 – 80 mm fl for the month of June and 77—89 mm fl for the month July (Pettit 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, with fish 55-60 mm fl by April 26 and May 3, 2004 and fish approaching 70 mm fl by mid-May (Rawding 2004).

Listed steelhead including emerging fry and migrating yearlings are present in the system. Depending on available temperature units, eggs will hatch in 4-7 weeks with fry emergence approximately 2-3 weeks after hatching (Table 5). Based on the migration and dispersal of the hatchery program, it is likely that a significant portion of this occurs before peak emergence of listed winter steelhead.

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

Wild steelhead smolts migrate from freshwater to saltwater from March through June (Loch et al. 1986). Wild steelhead smolts on the Lewis River system averaged 135-154 mm fl in 1997 and 1998 respectively (Hawkins 2002) and would likely not be prey items. Potential competition would be minimized due to the migratory state of hatchery and wild stocks at this time with Bjornn (1990), concluding that hatchery fish kept in the hatchery for extended periods before release as smolts (e.g. yearling salmonids) also may have different food and habitat preferences than wild fish, and that hatchery fish will be unlikely to out-compete wild fish and are at a competitive disadvantage in free flowing systems. Indirect take due to predation is unknown

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

Residualism: WDFW steelhead programs are reared and released in a smolted condition. To achieve this, the following rearing parameters are followed:

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

Migration Corridor/Ocean: It is unknown to what extent listed fish are available both behaviorally or spatially on the migration corridor. Once in the main stem, Witty et al. (1995)

has concluded that predation by hatchery production on wild salmonids does not significantly impact naturally produced fish survival in the Columbia River migration corridor. 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 and evaluation and research programs: The following monitoring baseline activities are conducted in the Lower Columbia Management Area (LCMA) for adult steelhead and salmon: redd surveys are conducted for winter steelhead in the SF Toutle, Coweeman, EF Lewis and Washougal rivers. Redd surveys are also conducted in the Cowlitz River for fall and spring chinook. Mark-recapture surveys provide data for summer steelhead populations in the Wind and Kalama rivers. Mark-recapture carcass surveys are conducted to estimate populations of chinook salmon in Grays, Elochoman, Coweeman, SF Toutle, Green, Kalama, NF Lewis, EF Lewis, rivers and Skamokawa, Mill, Abernathy, and Germany creeks and for all chum salmon populations. Snorkel surveys are conducted for summer steelhead in the EF Lewis, Washougal rivers. Trap Counts are conducted on the Cowlitz, NF Toutle, Kalama, and Wind rivers and on Cedar Creek a tributary of the NF Lewis River. Area-Under-the-Curve (AUC) surveys are conducted to collect population data for chum salmon in Grays River and Hardy and Hamilton Creeks. All sampling of carcasses and trapped fish include recovery of coded wide tagged (CWT) fish for hatchery or wild stock evaluation. Downstream migrant trapping occurs on the Cowlitz, Kalama, NF Lewis, and Wind rivers, Cedar Creek, and will expand to other basins as part of a salmonid life cycle monitoring program to estimate freshwater production and wild smolt to adult survival rates. Any take associated with monitoring activities is unknown but all follow scientific protocols designed to minimize impact.

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. There will be no direct take tables included for this program.

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

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

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

No data available.

Section 3: Relationship of Program to Other Management Objectives

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

For ESU-wide hatchery plans, the production of steelhead from Washougal and Skamania Hatcheries to Region 5 streams is consistent with:

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

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

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

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

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

Fish Health Policy in the Columbia Basin. Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Fish Policy Chapter 5, IHOT 1995).

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

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

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

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

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

Constraints on this facility relative to the IHOT Operation Plan are described in the Hatchery Evaluation Report Skamania Hatchery-Winter Steelhead 1997. The Clark Public Utility and the Department of Fish and Wildlife have a partnership (MOA) at the Vancouver Hatchery, which provides rearing, and incubation for the Skamania Winter Steelhead program. The Vancouver Hatchery provides pathogen free water, which provides IHN virus protection for Skamania Winter Steelhead during spring time rearing activities.

3.3 Relationship to harvest objectives.

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

Winter steelhead plants contribute to the E.F.Lewis, N.F. Lewis mainstem and limited Columbia River mainstem sport fisheries. Program is 100% mass marked (adipose fin-clipped) for the purpose of selective fisheries management. Selective fisheries were initiated for steelhead in the late 1980's in the lower Columbia River tributaries in order to provide maximum sport harvest (retention of adipose clipped fish only). Adults are not trapped at the return site so hatchery return is unknown.

This regulation requires the release of all wild steelhead. It is unknown what he harvest rate is on the E.F.Lewis steelhead program, but on the Kalama River harvest rates for hatchery fish are believed to range from 40% to 70% and averaged near 50%. The harvest rate of hatchery fish is expected to remain greater than 40% for most stocks while harvest rates have been as high as 70% for hatchery steelhead in the Cowlitz River. Until wild steelhead populations have recovered, wild steelhead release regulations will be in effect with incidental mortality limited to less than 7% on wild stocks.

Brood Year	Harvest # of Adults
1991	1,036
1992	1,901
1993	2,714
1994	882
1995	1,350
1996	647
1997	314
1998	163
1999	554
2000	896
2001	439
2002	2,149
2003	591
2004	Na

3.4 Relationship to habitat protection and recovery strategies.

Subbasin Planning and the Lower Columbia Fish Recovery Board (LCFRB):
The current Lewis System HGMP processes are 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 and may well use HGMP alternative ideas on how to utilize hatchery programs to achieve objectives and harvest goals. In order to assess, identify and implement restoration, protection and recovery strategies, Region 5 staff is involved in fish and wildlife planning and technical assistance in concert through the LCFRB including the role of fish release programs originating from Lewis River and Washougal Hatchery Complexes.

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) 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 winter 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*: Echo Bay Net summer steelhead smolts can be preyed upon through the entire migration corridor from the river subbasin to the mainstem Columbia River and estuary. Northern pikeminnows and introduced spiny rays 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 (river otters), and returning adults include: harbor seals, sea lions and Orcas.

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

3) Salmonid and non-salmonid fishes or other species that could positively impact the program. Multiple programs including 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 can be used throughout the basin. Assuming integrated spawning and carcass seeding efforts, approximately 100 – 500 adult steelhead carcasses could contribute approximately 500 – 2,500 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.

See Washougal/Skamania Winter Steelhead HGMP. Fish are planted, via truck, into the E.F. Lewis River.

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.

Not applicable to this plant, see Washougal/Skamania Winter Steelhead HGMP.

Section 5. Facilities

5.1 Broodstock collection facilities (or methods).

See Washougal/Skamania Winter Steelhead HGMP

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

Equip. Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Tanker Truck	1900	Y	N	90	Sodium Chloride (Salt)	5000 ppm (~0.5%)

See Washougal/Skamania Winter Steelhead HGMP for more information

5.3 Broodstock holding and spawning facilities.

See Washougal/Skamania Winter Steelhead HGMP

5.4 Incubation facilities.

See Washougal/Skamania Winter Steelhead HGMP

5.5 Rearing facilities.

See Washougal/Skamania Winter Steelhead HGMP

5.6 Acclimation/release facilities.

See Washougal/Skamania Winter Steelhead HGMP

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

IHN episodes can cause significant mortality in the program although Skamania outplants are taken from fish transferred to Vancouver Hatchery as being IHN free.

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.

See Washougal/Skamania Winter Steelhead HGMP

Section 6. Broodstock Origin and Identity

6.1 Source.

The Skamania Hatchery Winter Steelhead stock used for brood is from fish trapped at Skamania Hatchery (West Fork Washougal River). Since steelhead spawn from January to June, hatchery personnel selected the earliest returning and spawning steelhead to develop the Chambers Creek winter steelhead stock in the 1940's. This stock was transplanted to the lower Columbia when Beaver Creek Hatchery opened in the 1950's and subsequently used to develop the winter steelhead broodstock at Skamania. Spawning time and return time are approximately three months earlier for hatchery fish when compared to wild fish.

6.2.1 History.

See Washougal/Skamania Winter Steelhead HGMP for more information. The first fish captured at the Skamania Hatchery for brood began in about 1982. Releases have occurred every year since. Short falls of brood were made up from numerous hatcheries (see below). Timing of adult migration most likely occurs late Nov thru Feb with peak movement in January. The Skamania Hatchery is located on the lower end of the North Fork Washougal and has been stocking hatchery steelhead into the river system since 1957. Approximately 60,000 hatchery winter steelhead smolts are released annually in the Washougal River. These smolts are Skamania origin steelhead, reared primarily at the Skamania Hatchery on the Washougal, but also at the Vancouver and Merwin facilities. Interbreeding between hatchery and wild steelhead is thought to be very low because of the run timing.

Broodstock Source	Origin	Year(s) Used	
		Begin	End
Skamania Hatchery Winter Steelhead	H	1982	Present
Tokul Creek Hatchery Winter Steelhead	H	U	U
Beaver Creek Hatchery Winter Steelhead	H	1994	nya
Lewis River Hatchery Winter Steelhead	H	1996	1999
Cowlitz Hatchery Winter Steelhead	H	1994	1995
Kalama Hatchery Winter Steelhead	H	1999	1999
Chambers Creek Hatchery	H	U	U

6.2.2 Annual size.

See Washougal/Skamania Winter Steelhead HGMP.

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

See Washougal/Skamania Winter Steelhead HGMP.

6.2.4 Genetic or ecological differences.

See Washougal/Skamania Winter Steelhead HGMP.

6.2.5 Reasons for choosing.

See Washougal/Skamania Winter Steelhead HGMP.

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.

See Washougal/Skamania Winter Steelhead HGMP.

Section 7. Broodstock Collection

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

See Washougal/Skamania Winter Steelhead HGMP.

7.2 Collection or sampling design

See Washougal/Skamania Winter Steelhead HGMP.

7.3 Identity.

100% of the hatchery fish released are marked so that they can be distinguished from the natural population.

7.4 Proposed number to be collected:

7.4.1 Program goal (assuming 1:1 sex ratio for adults):
See Washougal/Skamania Winter Steelhead HGMP

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

See Washougal/Skamania Winter Steelhead HGMP

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

See Washougal/Skamania Winter Steelhead HGMP

7.6 Fish transportation and holding methods.

Equipment Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Tanker Truck	1900	Y	N	90	Sodium Chloride (Salt)	5000 ppm (~0.5%)

7.7 Describe fish health maintenance and sanitation procedures applied.

See Washougal/Skamania steelhead HGMPs.

7.8 Disposition of carcasses.

Not applicable to this plant.

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

See Washougal/Skamania Winter Steelhead HGMP.

Section 8. Mating

8.1 Selection method.

See Washougal/Skamania Winter Steelhead HGMP.

8.2 Males.

See Washougal/Skamania Winter Steelhead HGMP.

8.3 Fertilization.

See Washougal/Skamania Winter Steelhead HGMP.

8.4 Cryopreserved gametes.

See Washougal/Skamania Winter Steelhead HGMP.

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.

See Washougal/Skamania Winter Steelhead HGMP.

Section 9. Incubation and Rearing.

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

See Washougal/Skamania Winter Steelhead HGMP.

9.1.2 Cause for, and disposition of surplus egg takes.

See Washougal/Skamania Winter Steelhead HGMP.

9.1.3 Loading densities applied during incubation.

See Washougal/Skamania Winter Steelhead HGMP.

9.1.4 Incubation conditions.

See Washougal/Skamania Winter Steelhead HGMP.

9.1.5 Ponding.

See Washougal/Skamania Winter Steelhead HGMP.

9.1.6 Fish health maintenance and monitoring.

See Washougal/Skamania Winter Steelhead HGMP.

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

See Washougal/Skamania Winter Steelhead HGMP.

9.2.1 Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1990-2001), or for years dependable data are available.

See Washougal/Skamania Winter Steelhead HGMP. Data below represents ashougal/Skamania fish up to the point of transfer.

Year	Egg Take	Green-Eyed Survival (%)	Eyed-Ponding Survival (%)	Egg Survival Perfor-mance Std.	Fry-fingerling Survival (%)	Rearing Survival Perfor-mance Std.	Fingerling-Smolt Survival (%)
1995	360238	93.0	97.0	90	82.0	90	92.0
1996	642084	85.7	97.0	90	90.0	90	90.6
1997	209241	83.0	96.0	90	90.0	90	94.4
1998	396901	90.0	98.0	90	89.7	90	91.6
1999	425319	77.3	98.0	90	97.2	90	92.1
2000	72723	83.4	96.5	90	98.3	90	96.9
2001	289691	80.5	93.8	90	99.0	90	91.6

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

See Washougal/Skamania Winter Steelhead HGMP.

9.2.3 Fish rearing conditions.

See Washougal/Skamania Winter Steelhead HGMP.

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.

See Washougal/Skamania Winter Steelhead HGMP.

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

See Washougal/Skamania Winter Steelhead HGMP.

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*).

See Washougal/Skamania Winter Steelhead HGMP.

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

See Washougal/Skamania Winter Steelhead HGMP.

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

Besides time, size and past history, aggressive screen and intake crowding, swarming against sloped pond sides, a silvery physical appearance and loose scales during feeding events are signs of smolt development. From past history, hatchery specialists will reduce feed regimes in early spring as fish show signs of smolting. Also at this time feed conversions fall and fish appear leaner with condition factors falling well below 1.0 (K) to .90 (K). Staff can observe smolt ratios during final length frequency measurements upon release. Any observations of non-smolted fish are communicated to Merwin staff. ATPase activity is not measured.

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

None

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

See Washougal/Skamania Winter Steelhead HGMP.

Section 10. Release

10.1 Proposed fish release levels.

Up to 90,000 smolts.

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

Smolts are released at the upper end of Lewisville Park (RKm 24.0) and at Daybreak Park (RKm 17.0).

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

	Yearling Release		
Release Year	**No.**	**Date**	**Avg Size (fpp)**
1991	93,100	Mid April Early May	5.1
1992	141,700	Mid April-Early May	6.6
1993	104,400	Mid April-Early May	6.4
1994	140,700	Mid April-Early May	6.2
1995	120,200	Mid April-Early May	11.4
1996	135,200	Mid April-Early May	5.9
1997	105,200	Mid April-Early May	6.0
1998	106,600	Mid April-Early May	5.5
1999	100,900	Mid April-Early May	5.9
2000	125,100	Mid April-Early May	5.6
2001	90,000	Mid April-Early May	5.6
2002	91,300	Mid April-Early May	5.0
2003	90,600	Mid April	5.0-5.5
2004	92,165	Mid April	5.0-5.5

10.4 Actual dates of release and description of release protocols.

In 2001, fish were planted on April 17 and 18, in 2002 fish were planted on April 30 and May 1, in 2003 fish were planted from April 1-29th. Fish are loaded and trucked to the E.F. Lewis River for a direct plant at two locations (Daybreak Park boat launch and Lewisville County Park). From the tanker trucks, fish are planted via a 5 or 6 inch hose.

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	1900	Y	N	90	Sodium Chloride (Salt)	5000 ppm (~0.5%)

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

Smolts are pumped from Skamania ponds, and transported for direct releases into the East Fork Lewis River.

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

100% of the hatchery fish released are marked so that they can be distinguished from the natural population.

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

Fish above the program level of 90,000 will not be transferred unless communication with Fish Program staff was occurred.

10.9 Fish health certification procedures applied pre-release.

Prior to release, the population health and condition is established by the Area Fish Health Specialist at Skamania Hatchery. 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.

Not applicable, this is a direct plant.

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.

- The production and release of smolts through fish culture and volitional release practices fosters rapid seaward migration, limiting freshwater interactions with naturally produced Chinook and steelhead juveniles. (*WDFW Steelhead Rearing Guidelines).*
- WDFW uses acclimation and release of smolts in lower river reaches where possible. Smolt releases from this facility occur below known wild fish spawning and rearing habitat in the upper habitat.
- WDFW will be reviewing programs that drive the current release dates and implementing release dates to May 1st or later to allow listed fish additional growth.
- Returning hatchery fish are under heavy selective harvest and are identified by Ad clip mark. Hatchery stock and wild fish are isolated by timing.
- WDFW proposes to continue monitoring, research and reporting of hatchery smolt migration performance behavior, and intra and interspecific interactions with wild fish to assess, and adjust if necessary, hatchery production and release strategies to minimize effects on wild fish.
- WDFW fish health and operational concerns for Skamania Hatchery programs are communicated to Region 5 staff for risk management or needed treatment. See also section 9.7.

Section 11. Monitoring and Evaluation of Performance Indicators

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

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

With the loss of Mitchell Act funding, staffing and logistical support may be lost to continue the monitoring and evaluation of this and other programs on the Columbia River.

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

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

Section 12. Research

12.1 Objective or purpose.

No research is directly associated with the program. Research on the Kalama River is presently being conducted for steelhead programs involving hatchery and wild fish that will be applicable to Region streams.

12.2 Cooperating and funding agencies.

12.3 Principle investigator or project supervisor and staff.

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

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

12.6 Dates or time periods in which research activity occurs.

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

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

12.9 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).

12.10 Alternative methods to achieve project objects.

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

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

Section 13. Attachments and Citations

13.1 Attachments and Citations

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Section 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

14.1 Certification Language and Signature of Responsible Party

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

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____