HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	Fish First Summer Steelhead Echo Bay Net Pens
Species or Hatchery Stock	Summer Steelhead *(Oncorhynchus mykiss)* Skamania Hatchery and/or Merwin Hatchery Summer 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.

Lewis River Summer Steelhead- Fish First Echo Cove Net Pens

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

Summer Steelhead (*Oncorhynchus mykiss*)

ESA Status: Not listed and not a candidate for listing

1.3 Responsible organization and individuals.

Name (and title):	Eric Kinne
	Lewis River Complex Manager
Agency or Tribe:	Washington Department of Fish and Wildlife
Address:	600 Capitol Way N. Olympia WA 98501
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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
Fish First 4311 Northeast 26 Court, Vancouver, Washington 98663 Contact Person: John DiVittorio Ariel, Washington 98603	Non-Profit Fish Rearing and Salmon Recovery Partners

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

Funding Sources
Mitchell Act
Fish First (Non-Profit 501c) In-kind Contributions

Operational Information	Number
Full time equivalent staff	4.0
Annual operating cost (dollars)	$463,581

Staff and Annual Operating Costs are interchangeable and used for Skamania Summer Steelhead and Winter Steelhead Programs. This cannot be broken down for costs associated with the 50,000 eyed eggs to sub-yearling program from Skamania to Echo Bay Pens.

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, Echo Cove Net Pens//North Fork Lewis River/RKm 16.1/Lewis Subbasin WA/Columbia Lower

1.6 Type of program.

Isolated Harvest Program

1.7 Purpose (Goal) of program.

- Release 50,000 hatchery summer steelhead smolts at 5.0 FPP into the Lewis River.
- The purpose of this isolated program is to provide adult harvest under the selective fishery regulations (retention of adipose clipped fish only) and can provide some escapement to Lewis River for the broodstock hatchery production.

1.8 Justification for the program.

- The summer steelhead production at the Echo Bay Net Pens is a joint venture by WDFW and Fish First Co-op which unites local people, area sportsman and woman, business and government in restoring natural gamefish and their habitats in the Lewis River system.
- As a 501(c)3 non-profit organization that began on June 22, 1995, Fish First maintains a coalition of land owners, big business, small business, government groups, fishers, fish enhancement groups, commercial fisherman, sports fisherman and other interested parties to bring back selected streams and ecosystems to their fullest potential possible for current and future generations. This is being done by targeting Federal, State, and local programs that match donated funds; targeting projects that augment existing Federal, State and local programs; and enhancing habitat through education and hands-on improvement and reclamation programs. Since 1997, Fish First has been involved in the day to day operation of the Echo Bay Net Pen summer steelhead program. This is an important part of the goal in order to provide selected harvest fisheries vital to the Lewis River.
- In order to achieve management and reduce risk to listed fish, for programs designed for steelhead harvest, WDFW tries to minimize natural escapement of hatchery fish to protect the genetic diversity of wild stocks. 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.

In order to minimize impact on listed fish by WDFW facilities operation and the Lewis River Echo Bay Net Pen summer steelhead program, the following Risk Aversion are included in this HGMP:

Table 1. Summary of risk aversion measures for the Lewis River Echo Bay Net Pen summer steelhead program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.2	The Echo Bay Net Pen Facility has the following permits for operation: • SEPA checklist and Determination of Non-Significance (DNS) • Aquatics Resources Use Authorization No. 20-071210 • Cowlitz County Shoreline Substantial Development Permit • WDFW Hydraulic Project Permit The Speelyai Net Pen Facility meets guidelines not requiring the following permits: • "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit (>20,000 lbs total on site production and > 5,000 lbs of fish feed per month). • Army Corps of Engineers 404 Permit • DOE 401 Water Quality Permit
Intake Screening	4.2	
Effluent Discharge	4.2	
Broodstock Collection & Adult Passage	7.9	Not applicable, See Merwin Summer Steelhead HGMP.
Disease Transmission	7.9, 10.11	*Fish Health Policy in the Columbia Basin.* Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).
Competition & Predation	See also 2.2.3, 10.11	Current risk aversions and future considerations are being reviewed and evaluated for further minimizing impacts to listed fish.

1.9 List of program "Performance Standards".

See section 1.10 below.

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 the harvest of hatchery summer steelhead on the Lewis River. (current 10 yr. average is 2,255 fish, all programs combined). Contribution of this program cannot be identified independently.	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.
Region-wide, groups are marked in a manner consistent with information needs and protocols to estimate impacts to natural and hatchery origin fish	Use mass-mark (adipose-fin clip) for selective fisheries,	Returning fish are sampled throughout their return for length, sex, and mark.
Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens. Follow Co-managers Fish Health Disease Policy (1998).	Necropsies of fish to assess health, nutritional status, and culture conditions.	WDFW Fish Health Section inspects adult broodstock yearly for pathogens and parasites and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, WDFW's Fish Health Section recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as deemed necessary A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.
	Release and/or transfer exams for 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 (5 fish/lb) and released from the net pen site 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).

Prior to 2004, broodstock for this portion was collected at Skamania Hatchery. Starting in 2004, broodstock for this program is collected at Merwin Hatchery. See also HGMPs for Skamania Summer Steelhead and Merwin Summer Steelhead.

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	50000	5.0	May 1	North Fork Lewis River (Echo Cove Net Pens)	16.1	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.

Data below are total catch of hatchery summer run steelhead on the N.F Lewis River. It is not possible to differentiate the contribution of this program from other programs. (WDFW Historical database). Smolt–to-adult survival rates are not available.

Return Year	Sport Harvest Hatchery
1989/90	1,451
1990/91	1,991
1991/92	3,408
1992/93	2,542
1993/94	2,008
1994/95	1,237
1995/96	1,198
1996/97	442
1997/98	311
1998/99	453
1999/00	1,806
2000/01	3,916
2001/02	5,229
Average	1,999

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

The first year of operation for this Net Pen Program was 1997.

1.14 Expected duration of program.

The program is on-going with no planned termination.

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

The sole purpose of the release of Skamania stock summer steelhead into the NF Lewis is to continue a summer steelhead sport fishery while eliminating a directed harvest on wild summer steelhead. Smolts are trucked in from Skamania Hatchery and acclimated in net pens at Echo Bay (Rm 12.9) and then are released there to remain in the heart of the sport fishery so that they are highly susceptible to harvest. Returning hatchery steelhead that are trapped at Merwin Dam are marked and returned to the river just below the confluence with the EF Lewis (Rm 3.4) for additional harvest opportunity. If they are trapped at Merwin Dam a second time, they are trucked to Horseshoe Lake for additional sport harvest in a closed system. Any adults that escape the fishery may spawn in the system, but the historic spawning area for wild summer steelhead in the NF Lewis is not accessible at this time because of a series of dams that blocks migration.

1.16.2 Potential Alternatives to the Current Program

Alternative 1: Eliminate the non-local program and use the native stock for this program. WDFW is currently involved in a research project on the Kalama River that will provide

information on the feasibility of using the native population. This alternative would require mining of 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 NF 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.

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 programs produced from and released at Lewis River, Merwin and Speelyai Hatcheries.

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

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

ESA listed stock	Viability	Habitat
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.		

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.

Listed salmon and steelhead present in LCR include:
Lower Columbia River chinook salmon (*Oncorhynchus tshawytscha*) ESU (threatened effective May 24, 1999)
Lower Columbia River chum salmon (*Oncorhynchus keta*) ESU (threatened effective May 24, 1999)
Lower Columbia River steelhead (*Oncorhynchus mykiss*) ESU (threatened effective May 18, 1998)
Columbia Basin DPS Bull Trout *(Salvelinus confluentus*) (effective June 10, 1998 (63 FR 31647).
Lower Columbia River Coho (Oncorhynchus kisutch) is currently a candidate (proposed as threatened June 14, 2004).

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

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

Lower Columbia River 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 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, spawning 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 (including 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 Tule
1990	241	2,698	123		20,54	342	17,506	2,062	11
1991	174	2,567	123	33	5,085	230	9,066	3,494	52
1992	424	2,489	150		3,593	202	6,307	2,164	54
1993	327	2,218	281	3	1,941	156	7,025	3,836	0
1994	525	2,512	516	0	2,020	395	9,939	3,625	11
1995	774	2,231	375	30	3,044	200	9,718	2,969	4
1996	2,148	1,602	667	351	10,630	167	14,166	2,821	166
1997	1,328	2,710	560		3,539	307	8,670	4,529	148
1998	144	2,108	1,287	66	4,318	104	5,929	2,971	202
1999	93	997	678	42	2,617	217	3,184	3,105	126
2000	126	2,700	852	27	1,420	323	9,820	2,088	14
2001	646	5,013	4,951	132	3,714	530	15,000	3,901	444
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 creel surveyed 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 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		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)* is 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: Not applicable to this HGMP. See Skamania Hatchery Summer Steelhead HGMP.

Genetic introgression: To reduce the number of hatchery fish that could interbreed with listed steelhead, WDFW uses a wild steelhead management strategy. 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.

Indirect take from genetic introgression is unknown.

Rearing Program:

Operation of Hatchery Facilities: Net Pen operations impacts include water use from Merwin Lake and rearing effluent. Net Pen placement site and production limits fall with permitted and non-permitted limits (NPDES). 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: WDFW proposes to continue monitoring, research and reporting of hatchery smolt migration performance behaviors (Kalama River research efforts) that will be used to adjust if necessary hatchery production and release strategies. Any additional smolts or sub-smolts past program goals could be lake planted for resident fish harvest rather than be released. Skamania steelhead hatchery program maximizes smolting condition thru behavior, acclimation and releases at lower river sites, release timing, feed management and condition factor so released fish will migrate quickly to reduce affects of density limiting factors such as residualism, competition and predation. Indirect take from density 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): Steelhead 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 aware of studies that have estimated the predation risks to listed fish posed by the Lewis River Hatchery steelhead program. 'Predation by Juvenile Hatchery Salmonids on Wild Fall Chinook Fry in the Lewis River, Washington' (Hawkins and Tipping 1999), 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."

Along with 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: Steelhead smolts are released in late April or early May. The release date can influence the likelihood that listed species are encountered. 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). (see also below).

Relative Body Size: Studies and opinions on size of predator/prey relationships vary greatly and although there is evidence that salmonids can prey upon fish up to 50% of

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

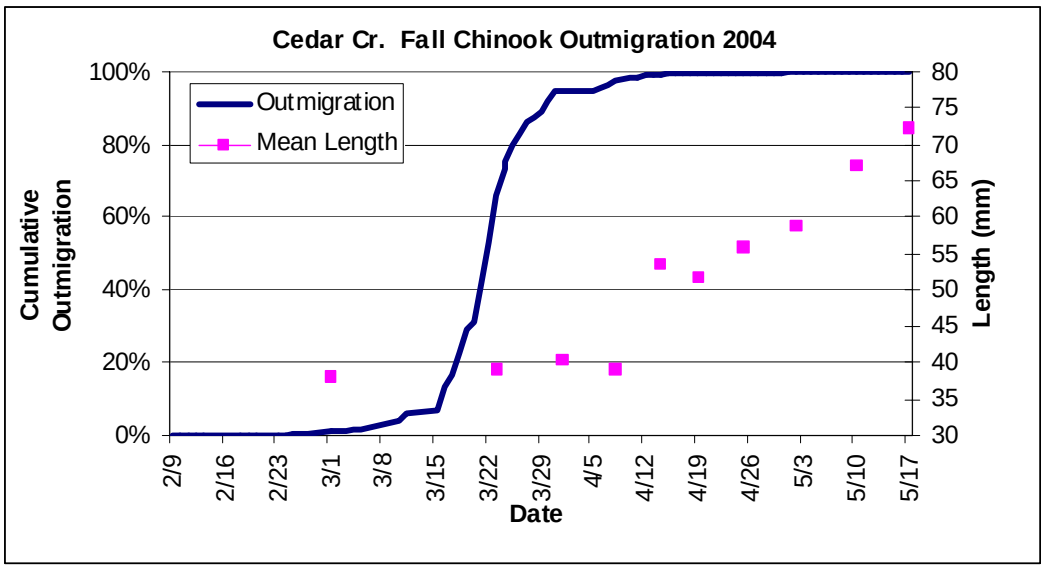
- Fork lengths of naturally produced chinook from the Lewis River system during the month of June indicate fish 48-55 mm fl (Columbia River Progress Report 2003-16). The Lewis River system fall chinook stock timing is the latest for the Columbia tributary stocks, and considered to be the worst case scenario (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 length 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, with fish 55-60 mm fl by April 26 and May 3, 2004 and fish approaching 70 mm fl by mid-May (Rawding 2004).

We have provided a summary of empirical information and a theoretical analysis of competition and predation interactions that may be relevant to the Echo Bay (Lewis River) summer steelhead program.

Potential Echo Bay Summer Steelhead predation and competition effects on listed salmonids: The proposed annual production goal for this program is up to 50,000 fish at an average size of 5.0 fpp (approximately 208 mm fl). Fish are released volitionally from mid-April to May 1st. 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. Hatchery migrants would encounter wild spring chinook fry and fingerlings. Due to size differences between yearling smolts and fingerlings, competition is probably low with first year chinook and steelhead due to food and spatial preference between species and age of fish. 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. Impact to listed chinook is lessoned due to the downstream location of the Echo Bay Net Pen Complex (RM 10.0), which is below known chinook habitat in the North Fork and Cedar Creek. Emigration from

Cedar Creek to the Lewis River occurs early starting in mid-March (Rawding 2004). Below (Figure 1) are length data vs. outmigration rate for Cedar Ck. fall chinook: (provided by D. Rawding WDFW).

Figure 1. Cedar Creek Chinook Outmigration



Actively migrating summer steelhead smolts released by late April or early May are unlikely to interact with listed steelhead fry as spawning time for wild winter steelhead stocks in the ESU occurs from March to May with April 20th the peak week of spawning and depending on available temperature units, eggs will hatch in 4-7 weeks with fry emergence approximately 2-3 weeks after hatching which indicates listed fish not available until late May to mid June (LCSI Draft 1998). Wild summer steelhead fry emerge from late April through July; juveniles generally rear in fresh water for two years; juvenile emigration occurs from March to May, with peak migration in early May (LCFRB Subbasin Technical Document 2004). Indirect take from predation or competition is unknown.

Table 6. General Lower Columbia Steelhead Spawn and Emergence Windows.

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

Listed Coho (Proposed): 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: To maximize smolting characteristics and minimize residualism, WDFW adheres to a combination of acclimation, volitional release strategies, size, and time guidelines (Lower Columbia Steelhead Conservation Initiative (LCSCI).

- 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.

Indirect take from residualism is unknown.

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

Monitoring:

Associated monitoring 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 additionally 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 summer steelhead from Echo Bay Net Pens 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).

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

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.

For the operation of the Echo Bay Net Pens:

- Department of Natural Resources lease of State Aquatic Lands - Plan of Development, Operation and Maintenance required for the Speelyai Bay Net Pens
- Pollution Prevention Plan pursuant to section S6.A-J of the Upland Fin-fish Hatching and rearing national Pollutant Discharge Elimination System Waste Discharge General Permit.
- Emergency Response Plan pursuant to section S6.A-J of the Upland Fin-fish Hatching and rearing national Pollutant Discharge Elimination System Waste Discharge General Permit.

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

- Clark Public Utility Partnership (Vancouver Hatchery)
- 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.

The releases of adipose-fin clipped summer steelhead provide sport harvest opportunity for anglers in the Lewis and lower Columbia rivers. They enter fisheries from March through October and most of the catch occurs from late May through August. Selective harvest regulations allow only the harvest of adipose-fin clipped summer steelhead in the lower Columbia River to protect wild summer steelhead. Specific harvest rates for the hatchery steelhead are unknown, however, punch card estimates for total harvest of marked hatchery steelhead are available by month for all areas open to sport harvest.

Only wild steelhead release fisheries are permitted in the Lower Columbia Management Area (LCMA). Estimated tributary fisheries exploitation (includes incidental mortality due to other-species targeted fisheries) rate in the LCMA on wild summer steelhead is < or = to 10%. Until wild steelhead populations have recovered, wild steelhead release regulations will be in effect with incidental mortality limited to less than 7% on wild stocks. The harvest rate of hatchery fish is expected to remain greater than 40% for most stocks.

Steelhead released from the Echo Bay Net Pens contribute to catches in the lower mainstem Lewis River and the N.F. Lewis. Below are sport harvest adult figures that combine adults produced from Echo Bay Net Pen releases and the steelhead planted from Merwin Hatchery (175,000).

Return Year	Sport Harvest Hatchery
1989/90	1,451
1990/91	1,991
1991/92	3,408
1992/93	2,542
1993/94	2,008
1994/95	1,237
1995/96	1,198
1996/97	442
1997/98	311
1998/99	453
1999/00	1,806
2000/01	3,916
2001/02	5,229
Average	1,999

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 River 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 Merwin 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 Echo Bay Net Pen summer steelhead program and are taken from the Puget Sound listed and non-listed HGMP template (WDFW and NOAA 2003).

(1) *Salmonid and non-salmonid fishes or species that could negatively impact the program*: 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.

For rearing at Skamania Hatchery, See Skamania Hatchery Summer Steelhead HGMP.

The Echo Bay Net Pen site was sited to be out of the mainstem flow of the N.F.Lewis River at river mile 10.0 but also have a directional even flow through the complex. River flow is dominated by winter rains; though summer flow in the Lower North Fork is slightly augmented by glacier melt in the upper basin. The lower 11 miles of the Lewis River mainstem can be tidally influenced by the backwater of the Columbia. Mean annual streamflow for the entire Lewis River system is approximately 6,125 cubic feet per second (cfs). Average annual flow measured below Merwin Dam is 4,849 cfs with In 1995, Article 49 of the Merwin Dam licensing agreement amended to provide for increased minimum flows of 2,700 cfs during spring smolt migration in April, May, and June (WDFW 1998).

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 Measures
Hatchery water withdrawal Screening Effluent Discharge	The Echo Bay Net Pen Facility has the following permits for operation: • SEPA checklist and Determination of Non-Significance (DNS) • Aquatics Resources Use Authorization No. 20-071210 • Cowlitz County Shoreline Substantial Development Permit • WDFW Hydraulic Project Permit The Echo Bay Net Pen Facility meets guidelines not requiring the following permits: • "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit (>20,000 lbs total on site production and > 5,000 lbs of fish feed per month). • Army Corps of Engineers 404 Permit • DOE 401 Water Quality Permit

Section 5. Facilities

5.1 Broodstock collection facilities (or methods).

Broodstock collection not part of this HGMP, see Skamania/Merwin Summer Steelhead HGMP.

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

Fish can be transferred to the Echo Bay Net Pens and eventually for planting downstream by the following vehicles:

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%)

5.3 Broodstock holding and spawning facilities.

Broodstock collection not part of this HGMP, see Skamania/Merwin Summer Steelhead HGMP.

5.4 Incubation facilities.

Broodstock collection not part of this HGMP, see Skamania/Merwin Summer Steelhead HGMP.

5.5 Rearing facilities.

Eyed eggs are shipped from Merwin Hatchery to Skamania Hatchery for incubation, hatching and rearing to yearling size before transfer to Echo Bay Net Pens located on the N.F. Lewis River at RKm 20.9.

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

Fish are reared in these receptacles until transfer at the end of March to the Echo Bay Net Pens.

5.6 Acclimation/release facilities.

Six net pens (dimensions 20'X20'X10') provide 4000 cubic feet of rearing each. One net pen (dimensions 12'X60'X10') provides 8640 cubic feet of rearing. Configuration for the pen complex is two rows of three of the 20'X20' pens in line. The larger pens straddles one row of three pens. A system of walkways (3' wide) surrounds all the pens and is constructed on the

complex frame. The pens are securely anchored in Echo Bay by stone anchors. Fish are acclimated from late March to the 1st week in May (approximately 36-40 days at) at this site and released from this site. Pen sides are lowered from the walkway frames directly into the river to liberate the fish.

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

Severe flooding events can cause early release if the net pen structure and program are determined to be in jeopardy.

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.

For equipment or operational net pen problems, the pens operate under an Emergency Response Plan pursuant to section S6.A-J of the Upland Fin-fish Hatching and Rearing National Pollutant Discharge Elimination System Waste Discharge General Permit. During storm water events, increased monitoring of the net pen program and communication with Lewis Hatchery Complex staff is conducted with contingency plans prepared. Fish health is monitored by staff and any problems are quickly communicated if observed.

Section 6. Broodstock Origin and Identity

6.1 Source.

Hatchery identified broodstock for this program can come from Skamania and/or Merwin Hatcheries. See also Skamania/Merwin Summer Steelhead HGMP.

6.2.1 History.

Hatchery stocks from Skamania and/or Merwin Hatcheries have been propagated for many years for region plants. The steelhead broodstock program at Merwin is a result of that effort. See also Skamania/Merwin Summer Steelhead HGMP.

6.2.2 Annual size.

Hatchery identified broodstock for this program can come from Skamania and/or Merwin Hatcheries. See also Skamania/Merwin Summer Steelhead HGMP.

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

This is an isolated program. Natural Origin Recruits (NOR) are not integrated within the broodstock program. See also Skamania/Merwin Summer Steelhead HGMP.

6.2.4 Genetic or ecological differences.

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

6.2.5 Reasons for choosing.

For decades the Skamania Hatchery Summer Steelhead broodstock has been obtained directly from adults returning to the hatchery. There has been a long history of adaptation of the stock to the Skamania facility, contributing to the success of the summer steelhead program. Skamania stock has been the source of nearly all the hatchery summer steelhead smolts that WDFW releases in the Lower Columbia River region. Also see Skamania and Merwin Summer Steelhead HGMPs.

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.

Listed fish are not used in broodstock selection and can be identified by adipose fin presence and are released in stream reaches as prescribed by WDFW Region 5 biologists.

Section 7. Broodstock Collection

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

Broodstock collection not part of this HGMP, See also Skamania/Merwin Summer Steelhead HGMP.

7.2 Collection or sampling design

See also Skamania/Merwin Summer Steelhead HGMP.

7.3 Identity.

All hatchery-origin Skamania or Merwin summer steelhead are adipose fin clipped. Only adipose fin-clipped adults are used for broodstock. Presently, adult broodstock are randomly selected over the entire run entry pattern based on program protocols and guidelines set forth by program/agency geneticists.

7.4 Proposed number to be collected:

7.4.1 Program goal (assuming 1:1 sex ratio for adults):
Broodstock collection not part of this HGMP, See also Skamania/Merwin Summer Steelhead HGMP.

7.4.2 Broodstock collection levels for the last twelve years (e.g. 1990-2001), or for most recent years available.
Broodstock collection not part of this HGMP, See also Skamania/Merwin Summer Steelhead HGMP.

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

Broodstock collection not part of this HGMP, See also Skamania/Merwin Summer Steelhead HGMP.

7.6 Fish transportation and holding methods.

Broodstock collection not part of this HGMP, See also Skamania/Merwin Summer Steelhead HGMP.

7.7 Describe fish health maintenance and sanitation procedures applied.

Broodstock fish health is not part of this HGMP, See also Skamania/Merwin Summer Steelhead HGMP.

7.8 Disposition of carcasses.

Broodstock collection not part of this HGMP, See also Skamania/Merwin Summer Steelhead HGMP.

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.

Broodstock collection not part of this HGMP, See also Skamania/Merwin Summer Steelhead HGMP.

Section 8. Mating

8.1 Selection method.

Broodstock selection is not part of this HGMP, See also Skamania/Merwin Summer Steelhead HGMP.

8.2 Males.

Not applicable, See also Skamania/Merwin Summer Steelhead HGMP.

8.3 Fertilization.

Not applicable, See also Skamania/Merwin Summer Steelhead HGMP.

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.

Not applicable, See also Skamania/Merwin Summer Steelhead HGMP.

Section 9. Incubation and Rearing.

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

See Skamania/Merwin Summer Steelhead HGMP.

9.1.2 Cause for, and disposition of surplus egg takes.

Not applicable, see Skamania/Merwin Summer Steelhead HGMP.

9.1.3 Loading densities applied during incubation.

Not applicable, see Skamania/Merwin Summer Steelhead HGMP.

9.1.4 Incubation conditions.

Not applicable, see Skamania/Merwin Summer Steelhead HGMP.

9.1.5 Ponding.

Not applicable, see Skamania/Merwin Summer Steelhead HGMP.

9.1.6 Fish health maintenance and monitoring.

Not applicable, see Skamania/Merwin Summer 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.

Not applicable, see Skamania/Merwin Summer Steelhead HGMP.

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

Table below indicates survival from egg to smolts at Skamania.

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

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

For the Echo Bay Net Pen densities, steelhead poundage is programmed to not exceed 0.50 lbs/per cubic ft. At 7,500 smolts per net pen, actual maximum loadings are 0.375 lbs per cubic ft.

9.2.3 Fish rearing conditions.

Environmental parameters: water temperatures and dissolved oxygen are monitored on a routine basis thru the rearing period. Net pen covers are used to prevent avian predation during the rearing period. Demand feeders are used for feeding.

9.2.4 Indicate biweekly or monthly fish growth information (average program performance), including length, weight, and condition factor data collected during rearing, if available.

Rearing Period	Length (mm)	Weight (fpp)	Condition Factor	Growth Rate
April	36	1000	nya	0.54
May	46	400	nya	0.60
June	64	175	nya	0.56
July	80	90	nya	0.48
August	101	45	nya	0.50
September	139	17	nya	0.63
October	153	13	nya	0.23
November	167	10	nya	0.23
December	173	9.0	nya	0.10
January	180	8.0	nya	0.11
February	188	7.0	nya	0.12
March	198	6.0	nya	0.14
April	198	5.0		0.08

Growth rates are for Skamania summer steelhead and are representative of the Echo Bay steelhead program.

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)	Lbs. Fed Per gpm of Inflow	Food Conversion During Period
12-Release	Trout AB 2.5	Demand Feeders	> 1.0% daily	Not applicable	>1.5:1.0

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

Fish First staff conducts work at the net pens 3-7 days weekly. Observations and weekly progress is communicated to Merwin Hatchery staff. Loss rate above normal < 1 fish per day (0.02) or problems are reported immediately. The hatchery staff would communicate with the area fish health specialist to schedule a visit. By the time fish are at a larger size, health problems have been generally minor. After release, net pens are removed from the water, dried and broom cleaned at the hatchery grounds and stored.

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

Besides time, size and condition factors, staff can observe aggressive swarming against net pen sides. During final length frequency and weight sampling, staff can observe smolt and parr appearance ratios. Loose scales during feeding events are early signs of smolt development. From past history, hatchery specialists will reduce feed regimes in early spring as fish show signs of smolting. Also at this time feed conversions fall and fish appear leaner with condition factors falling well below 1.0 (K) to .90 (K). Staff can observe smolt ratios during final length frequency measurements upon release. Any observations of non-smolted fish are communicated to Lewis River Hatchery Complex staff. ATPase activity is not measured.

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

Although not a direct natural rearing method, net pen culture exposes fish to increased natural conditions that hatchery concrete raceways or release ponds may not provide. Net pens placed in river, lake or reservoir settings can serve to acclimate fish to some environmental and behavioral natural conditions. Terrestrial and invertebrate food items originating from the natural environment are beneficial to fish as supplemental food sources. During rearing, the Echo Bay Net Pens can be subjected to random predation attempts that can ultimately benefit their survival. This occurs when avian predators such as herons and kingfishers will perch on net pen covers and pen walkways and try to spear potential prey within the pen. Mammals (mink, river otters) will investigate the net pen site to try and catch fish.

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

Listed fish are not under propagation in this program.

Section 10. Release

10.1 Proposed fish release levels.

50,000 smolts at 5.0 lb from the Echo Bay Net Pens.

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

Fish are loaded into tanker trucks and hauled downstream to be planted below I-5 bridge.

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

	Yearling Release		
Release Year	No.	Date (MM/DD)	Avg Size (fpp)
1997	50167	May 5	6.5
1998	49982	May 2	5.16
1999	48303	April 1	6.0
2000	49597	Early May	4.8
2001	49105	Late April-Mid May	6.0
2002	49303	May 3	5.29

10.4 Actual dates of release and description of release protocols.

Fish are directly release at a time and size of release as specified in the program guidelines (5.0-5.5 fpp) during the period of April 15 to May 15. Pre-smolts are transferred from Skamania Hatchery in late March-early April to the net pens in Echo Cove to be acclimated for 30 days.

10.5 Fish transportation procedures, if applicable.

A 1900 gallon tanker is supplied with oxygen and Sodium Chloride (5000 ppm) and is used to haul the fish in approximately 20 minutes.

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

Pre-smolts are transferred from Skamania Hatchery in late March-early April to the net pens in Echo Cove to be acclimated for 30 days; and fish released (netting of pens dropped)and move into the N.F Lewis River during mid April-early May.

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

100% AD clipped. At time of mass marking, pin-heads/non-performing fish are selectively culled and destroyed.

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

No fish, above program level are transferred to the Echo bay Net Pens.

10.9 Fish health certification procedures applied pre-release.

Prior to release, the population health and condition is established by the Area Fish Health

Specialist. This is commonly done 1-3 weeks pre-release. Prior to this examine, whenever abnormal behavior or mortality is observed, staff also contacts the Area Fish Health Specialist. 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.

Complex manager would contact and inform regional management of the situation. Policy would generally be to retain fish at the site. There is an Emergency Response Plan pursuant to section S6.A-J of the Upland Fin-fish Hatching and rearing national Pollutant Discharge Elimination System Waste Discharge General Permit that outlines contingency plans in case of emergencies.

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.

In the past, Region staff can forego acclimation rearing at Echo Bay Net Pens for management or fish health issues and release the program directly into the N.F. Lewis at the lower I-5 site.

- Siting of the pens has sufficient depth and flow for siting guidelines.
- Program fish are confined in structures until an active smolting phase.
- Discharge effluents are under NPDES permit guidelines for monthly feed limits and total program production.
- The 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.
- All program fish are mass marked for heavy harvest removal.
- WDFW proposes to continue monitoring, research and reporting of hatchery smolt migration performance behavior, and intra and interspecific interactions with wild fish to access, and adjust if necessary, hatchery production and release strategies to minimize effects on wild fish.
- WDFW fish health and operational concerns for the Echo Bay Pen program is communicated to Region 5 staff for risk management or needed treatment.

Section 11. Monitoring and Evaluation of Performance Indicators

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

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. Current Fish program staff is available to complete monitoring and evaluation baseline Lower Columbia system needs while research is on-going for coho interaction in the Lewis River and steelhead in the Kalama 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 and “Best Practices” designed to minimize impact.

Section 12. Research

12.1 Objective or purpose.

No research is directly associated with the program. Results from research on Kalama River wild and hatchery steelhead and steelhead and studies on the Lewis River (Merwin hatchery) will be used for future management of steelhead programs in Region 5 programs. See Kalama River steelhead HGMPs and Merwin Hatchery steelhead HGMPs.

12.2 Cooperating and funding agencies.

NA

12.3 Principle investigator or project supervisor and staff.

NA

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

NA

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

NA

12.6 Dates or time periods in which research activity occurs.

NA

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

NA

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

NA

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).

NA

12.10 Alternative methods to achieve project objects.

NA

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

NA

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.

NA

Section 13. Attachments and Citations

13.1 Attachments and Citations

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12.) Gregory, S.V., G.A. Lamberti, D.C. Erman, K.V. Koski, M.L. Murphy, and J.R. Sedell. 1987. Influence of forest practices on aquatic production. *In* E.O. Salo and T.W. Cundy (editors), Streamside management: forestry and fishery interactions. Institute of Forest Resources, University of Washington, Seattle, Washington.

13.) Harlan, K. 1999. Washington Columbia River and tributary stream survey sampling results, 1998. Washington Department of fish and Wildlife (WDFW), Columbia River Progress Report. 99-15, Vancouver, WA.

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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:_____