HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

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

Fish First Summer Steelhead – Speelyai Bay 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
	Lower Columbia River Complex Manager
Agency or Tribe:	Washington Department of Fish and Wildlife
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program.

Co-operators	**Role**
PacifiCorp	Funding Source
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
PacifiCorp
Fish First (Non-Profit 501c) In-kind Contributions

Operational Information	Number
Full time equivalent staff	2.75
Annual operating cost (dollars)	$318,347

The above information for Full-Time Equivalent Staff and Annual Operating Cost applies cumulatively to all Merwin Hatchery Anadromous Fish Programs. Fish First provides operational support for the fish rearing portion.

1.5 Location(s) of hatchery and associated facilities.

Broodstock source	Lewis River Hatchery Summer Steelhead
Broodstock collection location (stream, RKm, subbasin)	Lewis River Hatchery Trap/North Fork Lewis River/RKm 20.9/Lewis; and Merwin Trap/North Fork Lewis River/RKm 25.8/Lewis
Adult holding location (stream, RKm, subbasin)	Merwin Hatchery/North Fork Lewis River/RKm 30.6/Lewis
Spawning location (stream, RKm, subbasin)	Merwin Hatchery/North Fork Lewis River/RKm 30.6/Lewis
Incubation location (facility name, stream, RKm, subbasin)	Merwin Hatchery/North Fork Lewis River/RKm 30.6/Lewis
Rearing location (facility name, stream, RKm, subbasin)	Merwin Hatchery/North Fork Lewis River/RKm 30.6/Lewis; and Speelyai Net Pens /Merwin Reservoir (N.F. Lewis River)/RKm 45.1/Lewis

1.6 Type of program.

Isolated Harvest Program

1.7 Purpose (Goal) of program.

- Release 50,000 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), provide protection of listed steelhead and can provide escapement for broodstock for continued Merwin hatchery production.
- Operate hatcheries consistent with the recovery of steelhead in the Lewis River. The major hatchery issues are: 1) to maintain the genetic diversity of steelhead in the Lewis River, and ensure the reproductive success of steelhead meets or exceeds recovery goals, 2) minimize the ecological interactions of hatchery steelhead on naturally produced salmon and steelhead, and minimize the mortality of naturally produced juvenile and adult salmon and steelhead due to facility operations.
- The Merwin Summer Steelhead Program from Speelyai Bay Net Pens unites local people, area sportsman and woman, business and government in restoring natural gamefish and their habitats in the Lewis River system.
- 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.

1.8 Justification for the program.

- Pacificorp (formerly Pacific Power and Light (PPL)) is the mitigation funding source on the North Fork Lewis River. They provide funding for operations of the three existing fish cultural facilities located on the North Fork system. The local enhancement group "Fish First" is involved in the operation of net pens located in Merwin Reservoir and at Echo Cove (in-river).
- The summer steelhead production at the Speelyai 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 Speelyai 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.
- WDFW protects listed fish and provides harvest opportunity on Lewis River summer steelhead through the Fish Management and Evaluation Plan (FMEP). The objectives of the WDFW's FMEP are based on the WDFW Wild Salmonid Policy. In that policy, it states that harvest rates will be managed so that 1) spawner abundance levels abundantly utilize available habitat, 2) ensure that the number and distribution of locally adapted spawning populations will not decrease, 3) genetic diversity within populations is maintained or increased, 4) natural ecosystem processes are maintained or restored, and 5) sustainable surplus production above levels needed for abundant utilization of habitat, local adaptation, genetic diversity, and ecosystem processes will be managed to support fishing opportunities (WDFW 1997). In addition, fisheries will be managed to insure adult size, timing, distribution of migration and spawning populations, and age-at-maturity are the same between fished and unfished populations. By following this policy, fisheries' impacts to listed steelhead, chinook salmon, and chum salmon in the Lower Columbia River (LCR) Evolutionary Significant Unit (ESU) will be managed to promote the recovery of these species and not at rates that jeopardize their survival or recovery.

  In order to minimize impact on listed fish by WDFW facilities operation and the Lewis River Speelyai 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 Speelyai Bay Net Pen summer steelhead program.

Potential Hazard	**HGMP Reference**	**Risk Aversion Measures**
Water Source	4.1	SEPA checklist and Determination of Nonsignificance (DNS). A Speelyai Bay Net Pen Environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of the completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.
Water Withdrawal	4.2	
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.
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 inspect adult broodstock yearly for pathogens and parasites and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, WDFW's Fish Health Section recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as deemed necessary A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.
	Release and/or transfer exams for 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.	Control 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).

See Merwin Summer Steelhead HGMP.

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

Age Class	Max. No.	Size (ffp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Water-shed	Eco-province
Yearling	50,000	5.0	1st week in May	North Fork Lewis River	RKm 8.1	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 as plants contributing to catch includes 175,000 smolts from Merwin Hatchery and 50,000 from Echo Bay Net Pens. (WDFW Historical Database 2004).

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 Speelyai Net Pens (Lake Merwin Reservoir) was 1994 .

1.14 Expected duration of program.

No planned termination date. On-going Co-op program.

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 Lewis stock (a derivative 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. Adults are trapped at Merwin Dam and are spawned and incubated at Merwin Hatchery. Rearing takes place at Merwin Hatchery and in net pens in Speelyai Bay. Smolts are trucked down to the forks for release to reduce interaction with wild fall chinook and other ESA listed species. Returning hatchery steelhead that are trapped at Merwin Dam are marked and returned to the river just below the confluence with the E.F. 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.

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 (Proposed)	Na	Na
H, M and L refer to high, medium and low ratings, low implying critical and high healthy.		

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

Listed salmon and steelhead present in LCR include
Lower Columbia River chinook salmon *(Oncorhynchus tshawytsch*a) ESU (threatened effective May 24, 1999)
Lower Columbia River chum salmon (*Oncorhynchus keta*) ESU (threatened effective May 24, 1999)
Lower Columbia River steelhead *(Oncorhynchus mykis*s) ESU (threatened effective May 18, 1998).
Columbia Basin DPS Bull Trout *(Salvelinus confluentu*s) were listed as threatened on June 10, 1998 (63 FR 31647).
Lower Columbia River Coho (*Oncorhynchus kisutch*) is currently a candidate for listing but has been proposed as threatened on June 14, 2004.

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

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

Lower Columbia River spring chinook salmon *(Oncorhynchus tshawytsch*a)
At one time, an indigenous stock of spring chinook existed in the Lewis River, but with the construction of Merwin Dam (RM 19.5) in 1931, the majority of the spawning reaches became inaccessible and the stock subsequently declined. Early attempts to save the stock through

hatchery production failed. By 1950, only a remnant population existed in the river, spawning primarily in the waters immediately below Merwin Dam and Cedar Creek. In 1971, managers used the Carson Hatchery stock, which originated from Bonneville Dam Fishway. These fish were reared and released from Speelyai Hatchery. Since then, releases have been made from both the Speelyai and the Lewis River hatcheries. The stocks used now include Cowlitz and Kalama, along with on-station returns to the Lewis River. The 1977 through 1987 average run size to the Lewis River was estimated at about 6,000 fish, with about 10 percent of the returns constituting jacks. Annual returns during this time period have ranged from about 2,300 adults in 1980 to nearly 17,000 adults in 1987. Although the spring chinook has a low contribution rate in terms of ocean harvest, returns do provide mainstem recreational fisheries and a popular sport fishery within the Lewis River. In river sport catch estimates during 1977 through 1987 have ranged from about 1,250 to nearly 10,000 adults, with an average annual catch of about 3,660 adults. In addition, number of jacks are also taken, a significant averaging about 400 per year, Natural escapement of adult fish, 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 (included hatchery and wild fish, FMEP 2003).

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

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

Table 3. Fall chinook salmon abundance estimates in the LCMA (FMEP 2003)

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

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

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

Brood Year	Pop Est Trap	Snorkel Surveys			Index/Redds
	Kalama	E.F. 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	E.F. 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 (USFWS 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: NOAA 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 NOAA has determined that these artificially propagated stocks are genetically no more than moderately divergent from the natural populations (NOAA, 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). The following are identified as general hatchery actions that have direct mortality (via predation, broodstock collection and disease transmission) and indirectly through genetic and ecological interactions in the natural environment:

Broodstock Program:

Broodstock Collection: Not applicable to this HGMP. See Merwin 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 (WDFW Kalama River research); 5) use hatchery management practices, acclimation, timing, and lower river releases to limit steelhead residualism and the competition and predation that can occur when steelhead smolts 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 through 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 SWIG (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) NOAA (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 (including Speelyai Net Pens). '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 SWIG (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).

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

salmon and steelhead released from western Washington artificial production programs are in a smolted condition and have typically been found to migrate rapidly downstream. The current release location is at RKm 68.0, however WDFW and the Yakama Tribe are exploring options for lower river sites (RKm 36.0) for acclimation and release.

Relative Body Size: Studies and opinions on size of predator/prey relationships vary greatly and although there is evidence that salmonids can prey upon fish up to 50% of their body length, most prey consumed is probably much smaller. Keeley and Grant (2001) suggest that the mean prey size for 100-200 mm fl salmonids is between 13-15% of predator body size. Salmonid predators were thought to be able to prey on fish up to approximately 1/3 of their length (USFWS 1994), although coho salmon have been observed to consume juvenile chinook salmon of up to 46% of their total length in aquarium environments (Pearsons et al. 1998). Artic char are well known as piscivorous predators, but recent studies suggest the maximum prey size is approximately 47% of their length (Finstad et al. 2002). The "33% of body length" criterion for evaluating the potential risk of predation in the natural environment has been used by NOAA Fisheries and the USFWS in a number of biological assessments and opinions (c.f., USFWS 1994; NOAA 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 Speelyai Bay (Lewis River) summer steelhead program.

Potential Speelyai 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)

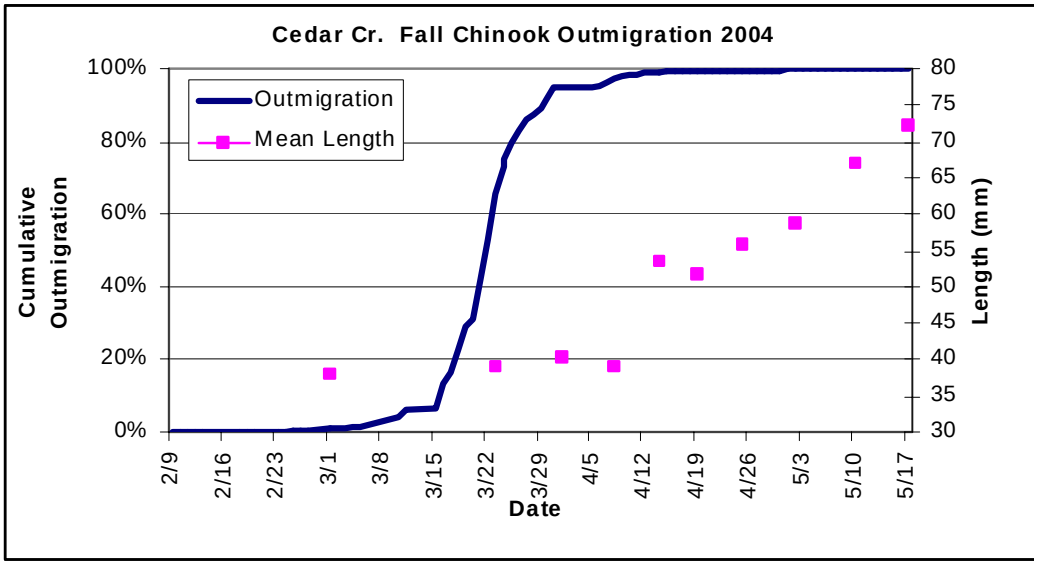

Figure 1.

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 Steelhead Spawn and Emergence Windows.

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

Listed coho (proposed):
Current lengths and data for listed coho in the Lower Columbia ESU is unknown.

Depending on water temperatures, hatchery coho fry during the month of April can range from 42 – 40 mm fl and be 50 mm fl by the first of May (LCR coho growth data 2001). Indirect take from competition or predation is unknown.

- *Residualism*: To maximize smolting characteristics and minimize residual steelhead, WDFW adheres to a combination of acclimation, volitional release strategies, active pond management, size, and release guidelines (WDFW Steelhead rearing guidelines July 31, 2001). Condition factors of 0.90-0.99 (K factor) and co-efficient of variation on fork lengths (CVs) of less than 10% are steelhead the release guidelines. Recent research (Rhine et al. 1997, Bigelow 1997) indicates steelhead smaller than 180 mm are more prone to residualize, while smolting and survival are optimized for fish greater than 190 mm fl (WDFW Steelhead rearing guidelines July 31, 2001). As a case in point, data from steelhead release programs on the Toutle River system are representative of the Lower Columbia steelhead programs at release that illustrates that few fish are <180 mm fl and greater than > 250 mm fl on release. Below are presented length frequency samples of 100 smolts from 20,000 summer steelhead released directly from the N.F.Toutle Hatchery and 20,000 summer steelhead released from the Cowlitz Game and Anglers Acclimation Pond located on the S.F. Toutle River. In both cases, few fish are outside these general guidelines for optimum steelhead size at release. Indirect take from residualism is unknown.

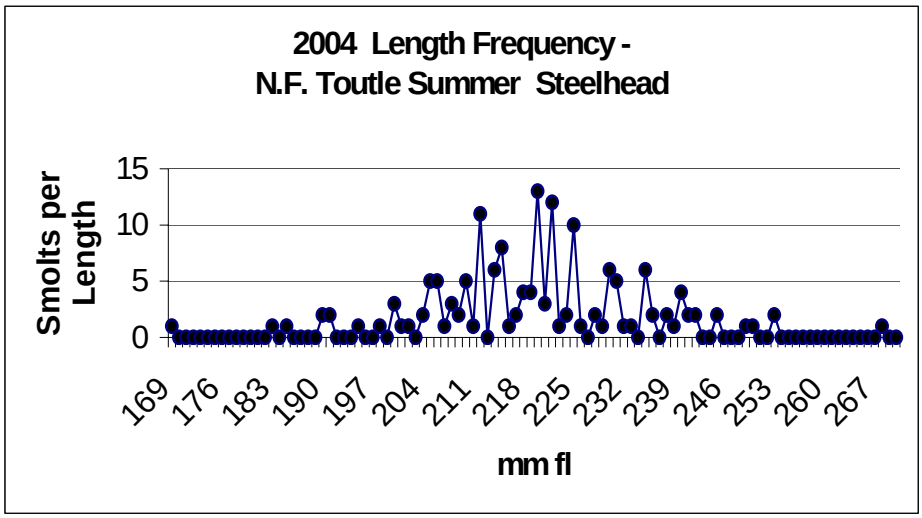

Figure 2. N.F. Toutle Summer Steelhead Plants (Hatchery Site Plants)

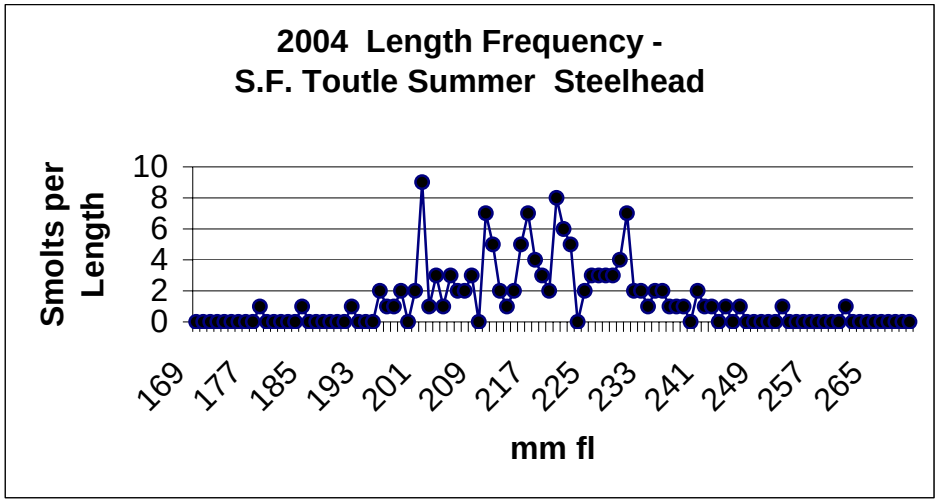

Figure 3. S.F. Toutle Summer Steelhead Plants (Hatchery Site Plants)

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, E.F. 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, E.F. Lewis, rivers and Skamokawa, Mill, Abernathy, and Germany creeks and for all chum salmon populations. Snorkel surveys are conducted for summer steelhead in the E.F. 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. (No direct take tables are included with this HGMP).

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.
Not applicable, see Merwin summer steelhead HGMP.

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 Speelyai 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).

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

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

National Pollutant Discharge Elimination System Permit Requirements This permit sets forth allowable discharge criteria for hatchery effluent and defines acceptable practices for hatchery

operations to ensure that the quality of receiving waters and ecosystems associated with those waters are not impaired.

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

Speelyai 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:

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

3.3 Relationship to harvest objectives.

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. (See also Section 1.12).

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 Speelyai 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*: Speelyai 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.

In 2000, the Speelyai Net Pen program was moved from the original location directly upstream of Merwin Dam to the present Speelyai Bay location which is approximately 0.5 miles below Speelyai Hatchery in Speelyai Bay. The original Merwin Dam site is not permanently abandoned but will kept as a preferred option when PacifiCorp, or PP&L (Pacific Power and Light), the operators of the dam, have finished new construction that required the move from the site which had a maximum depth of 140 feet. The present site is close to the mouth of Speelyai Bay where it widens to 600 – 900 feet. Two streams (Baker and Speelyai) feed Speelyai Bay and provide flow thru the area of the net pen site. The flow from mid-November through the first of May can range up to 300 cfs. The minimum water depth at this site would range from 31-35 feet which normally does not occur during the fish rearing period. A minimum depth from the net pen to the bottom of the lake would not be less than 15-19 during a lake drawdown event. If this does occur in event of reservoir drawn-down in advance of winter storm events, the average flows from the two feeder creeks picks up substantially (>300 cfs) to increase flow thru the area to off set potential impacts of a lower pool. The site has flow, depth and water quality with in the window of time that the program operates within. From mid summer on, the bay can be shallower with increased water temperatures and lake enrichment. By this time the program has concluded for the year. If the project can be relocated back at the dam site, the necessary review and permit application process will be initiated. Net pens will not be moved back and forth between the two locations. Anchors will be left in place since the area is secure behind the dam log boom. The new location will have the exact same anchor footprint as the Merwin Dam site. Sixty thousand (60,000) Summer Steelhead be raised in the pens from approximately November 15 to May 1 annually. The steelhead will weigh 12/lb (5000 pounds) when placed in the nets and 5.0/lb when released. Total fish weight will start at 5000 lb with a 7,000 net gain in weight.

4.2 Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

Potential Hazard	Risk Aversion Measure
Hatchery water withdrawal Intake/Screening Compliance Hatchery effluent discharges. (Clean Water Act)	The Speelyai 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 the 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 Merwin Summer Steelhead HGMP.

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

For fish transferred to the Speelyai Bay Net Pens and for planting downstream the following vehicles are available:

Equip. Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
2 Tanker Truck (Adult and Juvenile/Smolt Transport)	1800	Y	N	1-1.5 hours	nya	nya
1 Tanker Truck (Adult and Juvenile/Smolt Transport)	1100	Y	N	1-1.5 hours	nya	nya

5.3 Broodstock holding and spawning facilities.

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

5.4 Incubation facilities.

Incubation is not part of this HGMP, see Merwin Summer Steelhead HGMP.

5.5 Rearing facilities.

Six net pens (dimensions 20'X20'X10') provide 4000 cubic feet of rearing each. Two net pens (dimensions 30'X30'X10') provide 9000 cubic feet of rearing each. Configuration for the pen complex is two rows of three of the 20'X20' pens in line. The two larger pens are located together side by side and at one end of the complex. A system of walkways (3' wide) surround all the pens and are constructed on the complex frame. The pens are securely anchored in Speelyai Bay by stone anchors.

5.6 Acclimation/release facilities.

Acclimation occurs from early winter to May in Lake Merwin at the net pens. Beginning May 1st, the net pens are towed to a dock facility where steelhead smolts are transferred to tanker trucks where they are trucked to and released downstream at I-5 Bridge.

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

None

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 Speelyai Hatchery 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 Merwin Summer Steelhead HGMP.

6.2.1 History.

Hatchery stock 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 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 Merwin Summer Steelhead HGMP.

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

This is an isolated program. NORs are not integrated within the broodstock program. See also 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.

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

Section 7. Broodstock Collection

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

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

7.2 Collection or sampling design

See Merwin Summer Steelhead HGMP.

7.3 Identity.

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

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 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 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 Merwin Summer Steelhead HGMP.

7.6 Fish transportation and holding methods.

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

7.7 Describe fish health maintenance and sanitation procedures applied.

Broodstock fish health is not part of this HGMP, see Merwin Summer Steelhead HGMP.

7.8 Disposition of carcasses.

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

Section 8. Mating

8.1 Selection method.

Broodstock selection is not part of this HGMP, see Merwin Summer Steelhead HGMP.

8.2 Males.

Not applicable, see Merwin Summer Steelhead HGMP.

8.3 Fertilization.

Not applicable, see 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 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.

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

A portion (60,000) of the fish transferred are part of this data.

9.1.2 Cause for, and disposition of surplus egg takes.

Not applicable, see Merwin Summer Steelhead HGMP.

9.1.3 Loading densities applied during incubation.

Not applicable, see Merwin Summer Steelhead HGMP.

9.1.4 Incubation conditions.

Not applicable, see Merwin Summer Steelhead HGMP.

9.1.5 Ponding.

Not applicable, see Merwin Summer Steelhead HGMP.

9.1.6 Fish health maintenance and monitoring.

Not applicable, see 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.

All eggs incubated are from hatchery-origin marked adults only.

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 egg to smolt survival at Merwin Hatchery.

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	230060	nya	nya	nya	87.04	nya	95.28
1996	276500	nya	62.90	nya	93.53	nya	98.73
1997	66500	nya	99.60	nya	92.20	nya	98.48
1998	247500	nya	81.30	nya	93.93	nya	97.15
1999	325200	nya	78.6	nya	86.47	nya	99.80
2000	440609	nya	71.30	nya	90.67	nya	99.73
2001	634331	nya	98.44	nya	88.71	nya	99.51

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

For Speelyai 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 through 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
04/07/02	31.1	2245	1.88	0.54
05/24/02	44.0	601.1	0.88	0.60
08/15/02	91.0	50.0	1.20	0.50
10/07/02	124.2	21.1	1.12	0.23
11/08/02	144.2	12.5	1.20	0.23
12/13/02	166.0	8.3	1.18	0.10
3/11/02	188.0	6.2	1.10	0.14
04/03/02	201.6	5.0	1.10	0.08
04/28/02	213.8	4.8	0.95	nya

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

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

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 Speelyai 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.

60,000 fish are transferred in winter to the site. After loss, net production of up to 50,000 smolts at 5.0 FFP from the nets pens are available for planting. This varies from year to year depending on loss and potential pen shortages.

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

Steelhead are removed from the Speelyai Net Pens and trucked downstream and are planted at the I-5 bridge site.

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	5.0-5.5
1998	50044	May 2	5.0-5.5
1999	48443	April 1	5.0-5.5
2000	70082	Early May	5.0-5.5
2001	60000	Late April-Mid May	5.0-5.5
2002	58242	May 3	5.0-5.5
2003	Na	Na	Na

10.4 Actual dates of release and description of release protocols.

The net pen structure is moved to the walkway area where the pens are raised and fish loaded into tankers trucks. Tanker trucks plant the fish directly into N.F. Lewis River at the I-5 bridge. This plant is now scheduled to begin after May 1st.

10.5 Fish transportation procedures, if applicable.

Any combination of tankers below can be used depending on availability.

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

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

Up to 60,000 fish transferred from Merwin Hatchery to the Speelyai Net Pens (Lake Merwin Reservoir) located at RKm 47 for 1-2 months rearing. Beginning the first week of May, fish are

transported down to RKm 8.1 (N.F. Lewis River) for a direct river release at the I-5 bridge. Pre-smolts are transferred from Merwin Hatchery in late winter to the net pens. Fish are reared and acclimated in Lake Merwin for approximately 4 months before release.

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

100% AD clipped selective mark at Merwin Hatchery before transfer to Speelyai Bay Net Pens. 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

A level above 60,000 is not transferred to the 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 and up to 6 weeks on systems with pathogen free water and little or no history of disease. Prior to this examine, whenever abnormal behavior or mortality is observed, staff also conducts the Area Fish Health Specialist. 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 generally would 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.

Region staff can forego acclimation rearing at Speelyai Bay Net Pens for management or fish health issues and release the program directly into the N.F. Lewis.

- 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.
- Hatchery smolts releases are trucked to I-5 bridge for release to avoid listed fish interaction above this point.
- Returning hatchery fish are under heavy selective harvest and are identified by adipose fin-clip.
- Hatchery stock and wild fish are isolated by return timing.
- 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.

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.

1)A Steelhead Rearing Density Study to help define the rearing capacity of Merwin Hatchery. It may determine that fewer steelhead can be released to produce the same number of adults. This decrease could benefit listed natural stocks by reducing potential competition.

2)A Steelhead Precocity Study to help define the effects of feeding regimes and juvenile size on precocity. Reducing precocity rates would decrease residualism which would reduce competition with listed natural juveniles. This could also reduce release numbers, as well.

3)A Steelhead study has been done on using a passive-sorting technique to reduce CV variation. This could benefit listed stocks by reducing potential competition and predation.

12.2 Cooperating and funding agencies.

WDFW and PacifiCorp

12.3 Principle investigator or project supervisor and staff.

Jack Tipping and Todd Hillson

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

Juveniles from hatchery stock are used in the research.

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

Steelhead Rearing Density Study.

Capture was done either with dip net or by seining ponds. MS-222 was used to anesthetize fish when needed. 300 juveniles were sampled just prior to release to determine mean length and K-factor. Study groups (approximately 60,000 in each group) were identified with blank coded-wire tags located in the cheek. Standard hatchery fish culture protocols were used throughout the rearing period.

Steelhead Precocity Study.

Approximately 6,000 juvenile fish reared in raceways are involved. Capture was done with dip nets. MS-222 was used to anesthetize fish when needed. 300 juveniles were sampled to determine a length distribution in mid-August. the largest 10 percent were then graded off and marked with a coded-wire tag. Three equal groups were made from the remaining fish and then equal numbers of marked fish were added into the three groups. These three groups were then fed different levels (power fed, normal ration, reduced ration) during the remainder of August and through September. All fish will be sampled/examined in late December and, again, prior to release for precocity.

Steelhead Auto Sorting

12.6 Dates or time periods in which research activity occurs.

Steelhead Rearing Density Study: Summer steelhead released in 1999-2001.
Steelhead Precocity Study: August to release, 2000-02

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

Steelhead Rearing Density Study.

Capture was done either with dip net or by seining ponds. MS-222 was used to anesthetize fish

when needed. 300 juveniles were sampled just prior to release to determine mean length and K-factor. Study groups (approximately 60,000 in each group) were identified with blank coded-wire tags located in the cheek. Standard hatchery fish culture protocols were used throughout the rearing period.

Steelhead Precocity Study.

Approximately 6,000 juvenile fish reared in raceways are involved. Capture was done with dip nets. MS-222 was used to anesthetize fish when needed. 300 juveniles were sampled to determine a length distribution in mid-August. the largest 10 percent were then graded off and marked with a coded-wire tag. Three equal groups were made from the remaining fish and then equal numbers of marked fish were added into the three groups. These three groups were then fed different levels (power fed, normal ration, reduced ration) during the remainder of August and through September. All fish will be sampled/examined in late December and, again, prior to release for precocity.

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

None.

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).

None

12.10 Alternative methods to achieve project objects.

None

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

None

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.

No listed natural fish will be used in the research.

Section 13. Attachments and Citations

13.1 Attachments and Citations

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Section 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

14.1 Certification Language and Signature of Responsible Party

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

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____