HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	Coweeman Winter Steelhead Program (Transfer/Outplant from Elochoman Hatchery)
Species or Hatchery Stock	Winter Steelhead *(Oncorhynchus mykiss)* Elochoman River Hatchery Early Winter Steelhead Stock
Agency/Operator	Washington Department of Fish & Wildlife
Watershed and Region	Cowlitz 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.

Coweeman Winter Steelhead Program

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

Winter Steelhead (*Oncorhynchus mykiss*)

ESA Status: Not listed and not a candidate for listing

1.3 Responsible organization and individuals.

Name (and title):	Aaron Roberts
	Lower Columbia Hatchery Complex Manager
Agency or Tribe:	Washington Department of Fish and Wildlife
Address:	600 Capitol Way N. Olympia WA 98501-1091
Telephone:	(360) 673-6482
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program.

Co-operators	Role
National Marine Fisheries Service	Program Funding Source/Administrator (Mitchell Act)
Lower Columbia River Fly Fishers	Operate the LCRFF Smolt Acclimation Pond on the Coweeman River at River Mile 10.0

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

Funding Sources
Mitchell Act

Operational Information	Number
Full time equivalent staff	4.5
Annual operating cost (dollars)	$380,000.00

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

1.5 Location(s) of hatchery and associated facilities.

Broodstock source	Elochoman River Early Winter Steelhead
Broodstock collection location (stream, RKm, subbasin)	Elochoman River Hatchery/Elochoman River/RKm 11.3/Elochoman
Adult holding location (stream, RKm, subbasin)	Elochoman River Hatchery/Elochoman River/RKm 11.3/Elochoman
Spawning location (stream, RKm, subbasin)	Elochoman River Hatchery/Elochoman River/RKm 11.3/Elochoman
Incubation location (facility name, stream, RKm, subbasin)	Elochoman River Hatchery/Elochoman River/RKm 11.3/Elochoman
Rearing location (facility name, stream, RKm, subbasin)	Lower Columbia River Fly Fishers Acclimation Pond/Coweeman River/RKm 16.1/Cowlitz

1.6 Type of program.

Isolated Harvest - (Lower Columbia)

1.7 Purpose (Goal) of program.

- Rear and release up to 20,000 smolts into the Coweeman River system.
- The goal is to mitigate for activities within the Columbia River basin, which has reduced salmonid populations.
- The purpose is to provide maximum sport harvest under the selective fishery regulations (retention of adipose-clipped fish only) while eliminating a directed harvest on wild winter steelhead.
- Involve community support in WDFW programs (Lower Columbia River Fly Fishers)

For programs designed for steelhead harvest, WDFW tries to minimize natural escapement of hatchery fish to protect the genetic diversity of wild stocks. A 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: 1) limit the number of hatchery spawners by providing intense selective fisheries, and maintain high trapping efficiencies 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, such as acclimation, timing, and lower river releases to limit steelhead residualism and the competition and predation that can occur when steelhead smolts residualize; and 6) Follow the Integrated Hatchery Operations Team (IHOT 1995) guidelines to limit disease risks from hatchery steelhead.

1.8 Justification for the program.

The Coweeman winter steelhead program is funded through the Mitchell Act via National Marine Fisheries Service (NMFS) for the purpose of mitigation for lost fish production due to development within the Columbia River Basin. The program is authorized under the Columbia River Fisheries Development Program, Columbia River Fish Management Plan and U.S. vs. Oregon and the parties to this program, plan and court case are therefore involved in short and long-term production planning.

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

To minimize impacts on listed fish by WDFW facilities operation and the Coweeman winter steelhead program, the following Risk Aversion are included in this HGMP:

Table 1. Summary of risk aversion measures for the Coweeman winter steelhead program.

Potential Hazard	**HGMP Reference**	**Risk Aversion Measures**
Water Withdrawal	4.2	This project is a short-term rearing and off channel acclimation pond. Feeding and production stays under NPDES guidelines for permitting. The off channel pond meets guidelines not requiring the following permits: "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit (>20,000 lbs total on site production and > 5,000 lbs of fish feed per month).
Intake Screening	4.2	
Effluent Discharge	4.2	
Disease Transmission	7.9, 10.11	*Fish Health Policy in the Columbia Basin*. Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).
Competition & Predation	See also 2.2.3, 10.11	Current risk aversions and future considerations are being reviewed and evaluated for further minimizing impacts to listed fish

1.9 List of program "Performance Standards".

See HGMP section 1.10.

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

1.10.1 Benefits: Note: Portions of these performance indicators refer to the station origin (Elochoman).

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Assure that hatchery operations support Columbia River fish Mgt. Plan *(US v Oregon)*, production and harvest objectives	Contribute to a meaningful harvest for sport, tribal and commercial fisheries. Achieve a 10-year average of 161 adult steelhead harvest.	Survival and contribution to fisheries will be estimated for each brood year released. Work with co-managers to manage adult fish returning in excess of broodstock need.
Maintain outreach to enhance public understanding, participation and support of Washington Department of Fish & Wildlife (WDFW) hatchery programs	Provide information about agency programs to internal and external audiences. For example, local schools and special interest groups tour the facility to better understand hatchery operations. Off-station efforts may include festivals, classroom participation, stream adoptions and fairs.	Evaluate use and/or exposure of program materials and exhibits as they help support goals of the information and education program. Record on-station organized education and outreach events.
Program contributes to fulfilling tribal trust responsibility mandates and treaty rights	Follow pertinent laws, agreements, policies and executive and judicial orders on consultation and coordination with Native American tribal governments	Participate in annual coordination meetings between the co-managers to identify and report on issues of interest, coordinate management, and review programs (FBD process).
Implement measures for broodstock management to maintain integrity and genetic diversity Maintain effective population size.	A minimum of 150 adults are collected throughout the spawning run in proportion to timing, age and sex composition of return	Annual run timing, age and sex composition and return timing data are collected. Adhere to WDFW spawning guidelines. (WDFW 1983)
Region-wide, groups are marked in a manner consistent with information needs and protocols to estimate impacts to natural and hatchery origin fish	Use mass-mark (adipose-fin clip) for selective fisheries.	Returning fish are sampled throughout their return for length, sex, and mark
Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens. Follow Co-managers Fish Health Disease Policy (1998).	Necropsies of fish to assess health, nutritional status, and culture conditions	WDFW Fish Health Section inspects adult broodstock yearly for pathogens and parasites and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, WDFW's Fish Health Section recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as deemed necessary A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.
	Release and/or transfer exams for pathogens and parasites.	1 to 6 weeks prior to transfer or release, fish are examined in accordance with the Co-managers Fish Health Policy
	Inspection of adult broodstock for pathogens and parasites.	At spawning, lots of 60 adult broodstock are examined for pathogens
	Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens and parasites.	Controls of specific fish pathogens through eggs/fish movements are conducted in accordance to Co-managers Fish Health Disease Policy.

1.10.1 Risks:

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

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

Broodstock collection is done at Elochoman Hatchery with Coweeman steelhead transfers a portion of that collection. Also see Elochoman River Winter Steelhead (Early) HGMP.

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

In the past, 20,000 yearlings are acclimated and released from two ponds. For 2004, 15,000 fish have been released directly into the Coweeman River due to loss of Pond #1, 5,000 are released from Pond #2.

Age Class	Max. No.	Size (ffp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Water-shed	Eco-province
Yearling	20000 FBD	5.0	April-May	Coweeman	12.9 & 16.1	Coweeman	Cowlitz

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

Fish are released for harvest only. Smolt-to-Adult averages are not available. (WDFW Historical database). There is no escapement known for this program.

Return	Sport Harvest	Smolt Release
Year	Hatchery	
1990/91	223	44,100
1991/92	539	52,700
1992/93	416	45,200
1993/94	148	46,500
1994/95	185	51,200
1995/96	99	29,300
1996/97	72	40,600
1997/98	31	41,800
1998/99	30	20,000
1999/00	125	21,400
2000/01	37	18,200
2001/02	102	12,000
2002/03	96	19,800
2003/04	Na	14,879

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

The Coweeman River has been planted with hatchery steelhead since 1957 (WDF et. al.1993). 0

1.14 Expected duration of program.

Program is on-going but will be reviewed after 2004 release.

1.15 Watersheds targeted by program.

Cowlitz 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 Brief Overview of Key Items:

The purpose of the release of hatchery stock winter steelhead into the Coweeman River is to continue a winter steelhead sport fishery while eliminating a directed harvest on wild winter steelhead. These fish have been acclimated in two ponds adjacent to the Coweeman River. However, due to problems with one of the ponds, part of the fish will be released directly from the hatchery, into the Coweeman in 2004. Any adults that escape the fishery may spawn in the system. This stock spawns in January and February while the local wild stock spawn from mid-March through June. Lack of public access, poor harvest, and straying of these fish to the Elochoman River are issues with this program.

1.16.2 Potential Alternatives to the Current Program:

Alternative 1: Eliminate the program. This program will be reviewed after the 2004 release.

1.16.3 Potential Reforms and Investments

Reform/Investment 1: None identified.

Section 2: Program Effects on ESA-Listed Salmonid Populations

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

Programs for outplants from Elochoman Hatchery are described in "Biological Assessment For The Operation Of Hatcheries Funded by The National Marine Fisheries Service (March 99)". WDFW is writing HGMP's to cover all stock/programs and out plants produced at Elochoman Complex including; Columbia River Chum, fall Chinook, coho, summer and winter run steelhead.

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	M	L
Cowlitz Fall Chinook	L	L
Coweeman Fall Chinook-Natural	H	M
Toutle Fall Chinook	M	L
Late Winter Steelhead	H	L
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.

Lower Columbia River spring chinook salmon (*Oncorhynchus tshawytscha*) within the Evolutionary Significant Unit (ESU) are federally listed as "threatened" under the Endangered Species Act effective May 24, 1999.
Lower Columbia River fall chinook salmon *(Oncorhynchus tshawytscha*) are federally listed as "threatened" under the ESA on March 24, 1999.
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.
Lower Columbia River Coho (*Oncorhynchus kisutch*) is 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 by the Lower Columbia River/Willamette River Technical Review Team (TRT). The Coweeman River enters the Cowlitz River below the confluence of the Toutle River with the Cowlitz River.

Lower Columbia River spring chinook salmon (*Oncorhychus tshawytscha*) within the Evolutionary Significant Unit (ESU) are federally listed as "threatened" under the Endangered

Species Act effective May 24, 1999.
Status: No spring Chinook exist in the Coweeman, but spring Chinook from Cowlitz and the Toutle River can be encountered at the confluence of the Coweeman with the Cowlitz River.

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 *(Oncorhychus tshawytsch*a) within the Evolutionary Significant Unit (ESU) are federally listed as "threatened" under the Endangered Species Act effective May 24, 1999.
Status: Chinook from the Cowlitz River can be encountered at the confluence of the Coweeman with the Cowlitz River. Cowlitz fall chinook are indigenous and historically were abundant in the Cowlitz Basin (WDW 1990). In 1951, the fall chinook escapement to the Cowlitz River and tributaries was estimated at 31,000, with the following distributions: 10,900 to the mainstem Cowlitz and its minor tributaries, 8,100 to the Cispus, 500 to the Tilton, 6,500 to the Toutle, and 5,000 to the Coweeman (WDF 1951). Historically, fall chinook spawning occurred throughout the area available to anadromous fish, from the first favorable gravel riffle to the headwaters (WDF 1951). They migrated to and spawned within all the major tributaries to the Cowlitz, several of the smaller tributaries, as well as the main river. Stock status is rated depressed in 2002 because of chronically low escapements. Natural spawning abundance is more a reflection of the size of returns to the Cowlitz Salmon Hatchery and stray rates than of natural production. The natural spawning escapement goal is 3,000 adults. Until 2001 the goal had not been met since 1989 (SaSI 2002).

Status: Coweeman Fall Chinook *(Oncorhynchus tshawytsch*a): This is a native stock with wild production. In the 1992 SASSI, Coweeman fall chinook were characterized as being of mixed native and non-native origin with composite production based on a history of releases of Spring Creek, Washougal and Toutle hatchery chinook between 1951 and 1979. However, more recent analysis (Myers et al. 2002) indicates that Coweeman fall chinook are not especially similar to any existing lower Columbia River Hatchery chinook stock and are the most distinctive of the Washington lower Columbia tule fall chinook stocks. Stock status was rated depressed in 2002 because of chronically low escapements and a short-term severe decline in 1998, 1999 and 2000. Most tule fall chinook stocks, such as Coweeman fall chinook, experienced poor survival in the 1990s. Recently, 6 miles of index areas were added to the database. Therefore, new data are not comparable to older data. In 1951, WDF estimated fall chinook escapement to the Coweeman River was 5,000 fish. Coweeman River spawning escapements from 1964-2001 ranged from 40 to 2,148 (average 302). Coweeman River current escapement goal is 1,000 fish; the goal has been met three times since 1986. A smolt density

model predicted natural production potential for the Coweeman River of 602,000 smolts. This is one of two self-sustaining natural runs in the lower Columbia River; the recent year natural run has been stable at low levels without hatchery influence.

Status: Toutle Fall Chinook *(Oncorhynchus tshawytsch*a): About 20 miles of spawning and rearing area are available above the hatchery trap on the Green River (excluding tributaries) (WDF 1973). Natural spawners (hatchery and natural origin) from 1964 through 1979 averaged 42 percent (equal to 4,517 fish) of the Toutle subbasin spawners, which were estimated at 10,756 fish (Kreitman 1981 as cited in WDW 1990). The spawning grounds were destroyed by the 1980 eruption of Mt. St. Helens. The Toutle River Hatchery, located 0.5 miles up the Green River, began collecting brood stock again in 1990. Surplus hatchery fish were released upstream of the hatchery to spawn naturally. Brood stock has been from a mixture of sources since the 1980 eruption (WDW 1990). The estimated annual escapement of fall chinook in the Toutle and its tributaries in the early 1950s was 6,500. An estimated 80 percent of the total Toutle fall chinook run spawned in the lower five miles of the mainstem Toutle (WDF 1951). Annual surveys show the greatest abundance of adult fall chinook on the North Fork Toutle River to be in a 5 mile stretch from the Toutle River Hatchery (1/2 mile up the Green River) to Kid Valley Park on the North Fork Toutle. An average spawning escapement of 2,700 fall chinook was observed from 1968 to 1972, with a sharp increase beginning in 1971. Fall chinook were observed as far upstream as Spirit Lake (WDF 1973). An average of 10,756 adults returned each year to the Toutle River basin from 1964 through 1979 (pre-eruption).

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

Year	Cowee-man River	Cowlitz River	Green River	Toutle River	Kalama River	EF Lewis River	NF Lewis River	Washougal River	Wind River Bright	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 *(Oncorhychus. 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. Coweeman steelhead is a native stock with wild production. The Coweeman River has been planted with hatchery winter steelhead since 1957. Most of the releases were Chambers Creek Hatchery winter steelhead stock, whose spawning peak occurs almost 3 months prior to the spawning peak of the native stock. We do not believe that significant hybridization has occurred between the Chambers Creek stock and the native stock. In 1936, steelhead were reported in the Coweeman River during escapement surveys. Coweeman River total escapement counts from 1987-2001 ranged from 44-1,008 (average 393); escapement goal for the Coweeman is 1,064 fish; escapements have been low since 1989. Estimated potential

winter steelhead smolt production for the Coweeman River is 38,229 (EDT).

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

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

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

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

No direct take is associated with this acclimation and release.

Broodstock Program:

Broodstock Collection: Broodstock are not collected at this location. Refer to Elochoman River Winter Steelhead HGMP.

Genetic introgression: Hatchery fish account for most adult winter steelhead returning to the Coweemann; few wild winter steelhead are present. Also, spawn timing of wild fish and naturally spawning hatchery fish is different, so there is likely minimal interaction between adult wild and hatchery winter steelhead. Winter steelhead natural production is low; returning hatchery adults contribute little to natural production. Hatchery winter steelhead are released as smolts and clear the river quickly, so competition for food resources with natural salmonids is probably minimal. To reduce the number of hatchery fish that could interbreed with listed steelhead, WDFW uses a wild steelhead management strategy removing steelhead through selective harvest and aggressive trapping programs. In areas where little overlap of timing with potential later spawning wild steelhead, hatchery fish can be re-cycled through heavy sport harvest areas. After re-cycling and additional harvest, hatchery fish can be used for landlocked lake opportunities or for nutrient enhancement needs. Interbreeding between hatchery and wild steelhead is thought to be low because of differences in run timing (WDFW et al. 1993). Indirect take from genetic introgression is unknown.

Rearing Program:

Operation of Hatchery Facilities: The Coweeman Ponds No.1 and No.2 are used for short term rearing and spring acclimation. Pond 1 is not operable any more. Rearing within these off channel ponds do not exceed NPDES discharge requirements need for permitting. Indirect take from operation of the rearing is unknown.

Disease: Over the years, rearing densities, disease prevention and fish health monitoring have greatly improved the health of steelhead programs and quality smolts are transferred acclimation ponds. Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1994) chapter 5 have been instrumental in reducing disease outbreaks. Although starter rearing can have disease problems, when steelhead reach larger sizes (sub-yearling phase to yearling phase), they have generally been problem free. Prior to release, the steelhead population health and condition is communicated by Washougal Complex staff to management or is established by the Area Fish Health Specialist. This is commonly done 1-3 weeks pre-release and up to 6 weeks on systems with pathogen free water and little or no history of disease. Indirect take from disease is unknown.

Release:

Hatchery Production/Density-Dependent Effects: Releases of winter steelhead into the Coweeman River are moderate in number and therefore not expected to attract excessive amounts of predators toward wild fish. The current maximum 20,000 smolt plant is a minimum plant for steelhead programs in the Columbia system to achieve some meaningful harvest. Indirect take from density-dependent effects is unknown.

Competition: Salmon and steelhead feed actively during their downstream migration (Becker 1973; Muir and Emmelt 1988; Sager and Glova 1988) and if they do not migrate they can compete with wild fish. WDFW is unaware of any studies that have empirically estimated the competition risks to listed species posed by the program described in this HGMP. Studies conducted in other areas indicate that this program is likely to pose a minimal risk of competition:

1) As discussed above, coho salmon and steelhead released from hatchery programs as smolts typically migrate rapidly downstream. The SIWG (1984) concluded that "migrant fish will likely be present for too short a period to compete with resident salmonids." On station release in large systems may travel even more rapidly – migration rates of approximately 20 river miles per day were observed by steelhead smolts in the Cowlitz River (Harza 1998).
2) NMFS (2002) noted that ".where interspecific populations have evolved sympatrically, chinook salmon and steelhead have evolved slight differences in habitat use patterns that minimize their interactions with coho salmon (Nilsson 1967; Lister and Genoe 1970; Taylor 1991). Along with the habitat differences exhibited by coho and steelhead, they also show differences in foraging behavior. Peterson (1966) and Johnston (1967) reported that juvenile coho are surface oriented and feed primarily on drifting and flying insects, while steelhead are bottom oriented and feed largely on benthic invertebrates."
3) Flagg et al. (2000) concluded, "By definition, hatchery and wild salmonids will not compete unless they require the same limiting resource. Thus, the modern enhancement strategy of releasing salmon and steelhead trout as smolts markedly reduces the potential for hatchery and wild fish to compete for resources in the freshwater rearing environment. Miller (1953), Hochachka (1961), and Reimers (1963), among others, have noted that this potential for competition is further reduced by the fact that many hatchery salmonids have developed different habitat and dietary behavior than wild salmonids." Flagg et al (2000) also stated "It is unclear whether or not hatchery and wild chinook salmon utilize similar or different resources in the estuarine environment."
4) Fresh (1997) noted that "Few studies have clearly established the role of competition and predation in anadromous population declines, especially in marine habitats. A major reason for the uncertainty in the available data is the complexity and dynamic

nature of competition and predation; a small change in one variable (e.g., prey size) significantly changes outcomes of competition and predation. In addition, large data gaps exist in our understanding of these interactions. For instance, evaluating the impact of introduced fishes is impossible because we do not know which nonnative fishes occur in many salmon-producing watersheds. Most available information is circumstantial. While such information can identify where inter- or intra specific relationships may occur, it does not test mechanisms explaining why observed relations exist. Thus, competition and predation are usually one of several plausible hypotheses explaining observed results."

Predation (Freshwater): When discussing predation the magnitude of predation will depend upon the characteristic of the population of salmonids, the habitat in which the population occurs, overall food availability besides fish and the characteristics of the hatchery program (e.g., release time, release location, number released, and size of fish released). WDFW is unaware of any studies that have empirically estimated the predation risks to listed juvenile Chinook, chum or steelhead posed by the Coweeman Hatchery programs. In the absence of site-specific empirical information, the identification of risk factors can be a useful tool for reviewing hatchery programs while monitoring and research programs are developed and implemented.

Environmental Characteristics: The Coweeman River watershed is a small to medium sized creek system fed mostly by rain events. Peak flow is during December, while from February through April, flow average is approximately 250 cfs. By May, flow has reduced to 110 cfs (WRIA 28 LFA Final report Wade 2001).

Dates of Releases: Steelhead smolts are released in mid-April. If possible, options are being examined to have releases in May. This is done to minimize impact on listed chum and allow listed zero age stocks additional growth. Staff considers size, smolt condition and environmental conditions to determine the most optimal and safest release date for the program. Yearling programs close to release times are at the mercy of environmental conditions, and unforeseen problems such as high temperatures or unusual low water conditions could also require Region staff to consider early release.

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

Release Location and Release Type: The likelihood of predation may also be affected by the location and the type of release. The risk of predation may increase with the length of time that involves co-mingling. In the freshwater environment, this is likely to be affected by distribution of the listed species in the watershed, the location of the release and the speed at which fish released from the program migrate. Fish released from acclimation ponds emigrated at a greater rate (Harza 1998).

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

Potential Coweeman winter steelhead predation and competition effects on listed salmonids: The proposed annual production goal for this program is 20,000 fish in 2005. Releases in this program have ranged from 12,000 to 51,000 fish. Levels in the early 1990's averaged 43,000 fish; the current production is approximately 50% from those levels.

Steelhead releases are at 5.0 FPP (208 mm fl) and can be released starting April 15 of the year. Surplus fish above 20,000 are not transferred to the Coweeman. Coweeman steelhead releases (from mid April – May) could encounter listed Chinook, steelhead and chum in the Coweeman/Cowlitz basins and Columbia mainstem. Due to size differences between steelhead smolts and fingerling stages of listed fish, competition is probably low with regards to food and spatial preference between species and size. At 5.0-5.5 FPP (210 –206 mm fl), potential predation on listed chinook would be on fish of 69 mm fl and smaller. Predation on listed fish in the Coweeman system or in the mixing area in the Cowlitz River mainstem is unknown. Below are data available for some Columbia River Chinook:

- Lengths from the Lewis River system during the month of June indicate fish 48-55 mm fl (Columbia River Progress Report 2003-16).
- Average fork length by week from 26 sampling sites on the Kalama River by week indicate fish 44 mm fl on April 25, 46 mm fl on May 3, 56 mm fl on May 11, 62 mm fl by May 16, and ranges of 70 – 80 mm fl for the month of June and 77—89 mm fl for the month July (Pettit WDFW 1990).
- Fork lengths from Cedar Creek (tributary to the N.F. Lewis River) indicate that average Chinook lengths reach approximately 50 mm fl between the weeks of April 12 and April 19, 2004, with fish 55-60 mm fl by April 26 and May 3, 2004 and fish approaching 70 mm fl by mid-May (Rawding 2004).

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

Table 5. Steelhead Spawn and Emergence Windows.

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

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

Listed Coho (Proposed):

Current lengths and data for proposed listed coho in the Salmon Creek basin is unknown. Depending on water temperatures, general hatchery coho fry during the month of April can range from 42 – 40 mm fl and reach 50 mm fl by early May (Lower Columbia Hatchery coho fry data 2001).

Indirect take from competition and predation is unknown.

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

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

Migration Corridor/Ocean: It is unknown to what extent listed fish are available both behaviorally or spatially in the migration corridor. Once in the mainstem, Witty et al. (1995) has concluded that predation by hatchery production on wild salmonids does not significantly impact naturally produced fish survival in the Columbia River migration corridor. Evidence in estuarine and nearshore environments indicate that diets are often dominated by invertebrates. Durkin (1982) reported 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. There appears to be no studies demonstrating that large numbers of Columbia system smolts emigrating to the ocean affect the survival rates of juveniles in the ocean in part because of the dynamics of fish rearing conditions in the ocean. Indirect take in the migration corridor or ocean is unknown.

Monitoring:

Associated monitoring and evaluation and research programs: The following monitoring baseline activities are conducted in the Lower Columbia Management Area (LCMA) for adult steelhead and salmon: redd surveys are conducted for winter steelhead in the SF Toutle, Coweeman, EF Lewis and Washougal rivers. Redd surveys are also conducted in the Cowlitz River for fall and spring chinook. Mark-recapture surveys provide data for summer steelhead populations in the Wind and Kalama rivers. Mark-recapture carcass surveys are conducted to estimate populations of chinook salmon in Grays, Elochoman, Coweeman, SF Toutle, Green, Kalama, NF Lewis, EF Lewis, rivers and Skamokawa, Mill, Abernathy, and Germany creeks and for all chum salmon populations. Snorkel surveys are conducted for summer steelhead in the EF Lewis, Washougal rivers. Trap counts are conducted on the Cowlitz, NF Toutle, Kalama, and Wind rivers and on Cedar Creek a tributary of the NF Lewis River. Area-Under-the-Curve (AUC) surveys are conducted to collect population data for chum salmon in Grays River and Hardy and Hamilton Creeks. All sampling of carcasses and trapped fish include recovery of coded-wide-tagged (CWT) fish for hatchery or wild stock evaluation. Downstream migrant trapping occurs on the Cowlitz, Kalama, NF Lewis, and Wind rivers, Cedar Creek, and will expand to other basins as part of a salmonid life cycle monitoring program to estimate freshwater production and wild smolt to adult survival rates. Any take associated with monitoring activities is unknown but all follow scientific protocols designed to minimize impact

Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

In other HGMPs provided to NOAA (Puget Sound, Upper Columbia), indirect takes from hatchery releases such as predation and competition is highly uncertain and dependant on a multitude of factors (i.e. data for population parameters - abundance, productivity and intra species competition) and although HGMPs discuss our current understanding of these effects, it

is not feasible to determine indirect take (genetic introgression, density effects, disease, competition, predation) due to these activities. (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.

For other listed species, if significant numbers of wild salmonids are observed impacted by this operation, then staff would inform the WDFW District Biologist, Fish Health Specialist or Area Habitat Biologist who, along with the Hatchery Complex Manager, would determine an appropriate plan and consult with NOAA Fisheries for adaptive management review and protocols.

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

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.

The production developed for this program will be integrated with *U.S. v Oregon* and the Columbia River Fish Management Plan (CRFMP) and with hatchery plans documented in WDFW's yearly Future Brood Document (FBD), and Lower Columbia Fisheries Management and Evaluation Plan (2002 FMEP) which has been agreed to by NOAA for listed steelhead, chum, and Chinook in the ESU. The CRFMP defines the roles of harvest and production in the Columbia River basin, including the Snake River. The CRFMP has expired and the parties to *U.S. v Oregon* are in the process of renegotiating the plan. According to the schedule, a new plan is supposed to be finalized by spring 2004.

WDFW 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:

Genetic Manual and Guidelines for Pacific Salmon Hatcheries in Washington. These guidelines define practices that promote maintenance of genetic variability in propagated salmon (Hershberger and Iwamoto 1981). 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 (Seidel 1983). Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 7, IHOT 1995).

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

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

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

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

National pollutant Discharge Elimination System Permit Requirements This permit sets forth allowable discharge criteria for hatchery effluent and defines acceptable practices for hatchery operations to ensure that the quality of receiving waters and ecosystems associated with those

waters are not impaired.

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

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

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

3.3 Relationship to harvest objectives.

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

Steelhead from the Coweeman River contribute to targeted sport fisheries in the river. Program is 100% mass marked (adipose fin-clipped) for the purpose of selective fisheries management. No commercial or tribal fisheries target Coweeman winter steelhead; incidental mortality currently occurs during the lower Columbia River spring chinook tangle net fisheries. Treaty Indian harvest does not occur in the Coweeman River. Approximately 6.2% of returning Cowlitz River hatchery steelhead are harvested in the Columbia River sport fishery. Winter steelhead sport harvest (hatchery and wild) in the Coweeman River from 1986-1989 averaged 241 fish; since 1990, regulations limit harvest to hatchery fish only. ESA limits fishery impact of wild winter steelhead in the mainstem Columbia River and in the Coweeman River. ESA limits fishery impacts on wild winter steelhead at 2% per year. Harvest rates have been as high as 70% for hatchery steelhead in the Cowlitz River.

Until wild steelhead populations have recovered, wild steelhead release regulations will be in effect with incidental mortality limited to less than 7% on wild stocks. In most populations it is estimated to be less than 3%. The harvest rate of hatchery fish is expected to remain greater than 40% for most stocks.

Fish are released for harvest only. No escapement is intended for this program. From 1991 thru 2002, Average catch was 161 annually. (WDFW Historical database).

Return Year	Sport Harvest Hatchery	Smolt Release
1990/91	223	44,100
1991/92	539	52,700
1992/93	416	45,200
1993/94	148	46,500
1994/95	185	51,200
1995/96	99	29,300
1996/97	72	40,600
1997/98	31	41,800
1998/99	30	20,000
1999/00	125	21,400
2000/01	37	18,200
2001/02	102	12,000
2002/03	96	19,800

3.4 Relationship to habitat protection and recovery strategies.

Subbasin Planning and Salmon Recovery:
The current Coweeman River program originating from the Washougal HGMP processes are designed to deal with existing hatchery programs and potential reforms to those programs. A regional sub-basin planning process (Cowlitz River Subbasin Planning drafts May 17, 2002 and May 2004) is a broad-scale initiative that will provide building blocks of recovery plans used by the Lower Columbia Fish Recovery Board (LCFRB) for listed fish and may well use HGMP alternative ideas on how to utilize hatchery programs to achieve objectives and harvest goals. The current HGMP processes are designed to deal with existing hatchery programs and potential reforms to those programs. To assess, identify and implement restoration, protection and recovery strategies, Region 5 staff is involved in fish and wildlife planning and technical assistance in concert through the LCFRB including the role of fish release programs originating from WDFW Hatchery Complexes. This collaborative effort involves federal, state, tribal, and local governments and is coordinated by the LCFRB for the preparation of a Lower Columbia salmon recovery and fish and wildlife sub-basin plan. WDFW is both a technical resource and resource manager and under the work program, LCFRB is contracting with WDFW for technical and planning assistance in both recovery and sub-basin planning work.

Habitat Treatment and Protection:
WDFW is presently conducting or has conducted habitat inventories within the Cowlitz River – Coweeman subbasin. Ecosystem Diagnosis and Treatment (EDT) compares habitat today to that of the basin in a historically unmodified state. It creates a model to predict fish population outcomes based on habitat modifications. WDFW is also conducting a Salmon Steelhead Habitat Inventory Assessment Program (SSHIAP), 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:
The Washington State Conservation Commission has completed a limiting factors analysis (LFA) for the Coweeman subbasin (WRIA 26). Floodplain habitat within the lower 20 miles of the Cowlitz mainstem and within the lower Coweeman has been filled with Mount St. Helens deposits and disconnected from the river. Rearing and over-wintering habitat is limited within

the subbasin. Extensive logging and high road densities have left the subbasin hydrologically immature and subject to increased peak flows. High road densities and 69 miles of stream adjacent roads have also contributed excessive fine sediments to stream channels. Riparian conditions and Large Woody Debris (LWD) levels are generally poor throughout the subbasin, especially along the diked and developed lower reaches of the Cowlitz and the Coweeman Rivers. Water quality is generally good within the Cowlitz, but lack of riparian cover has contributed to elevated water temperatures and turbidity in the Coweeman watershed.

3.5 Ecological interactions.

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

(1) Salmonid and non-salmonid fish or species that could negatively impact the program: Coweeman winter steelhead smolts can be preyed upon release through the entire migration corridor from the river subbasin to the mainstem Columbia River and estuary. Northern pikeminnows and introduced spiny-rays in the Columbia mainstem sloughs can predate on steelhead smolts as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons. Mammals that can take a heavy toll on migrating smolts and returning adults include: harbor seals, sea lions, river otters, and Orcas.

(2) Salmonid and non-salmonid fishes or species that could be negatively impacted by the program: Co-occurring natural salmon and steelhead populations in local tributary areas and the Columbia River mainstem corridor areas could be negatively impacted by program fish. Of primary concern are the ESA listed endangered and threatened salmonids: Snake River fall-run Chinook salmon ESU (threatened); Snake River spring/summer-run Chinook salmon ESU (threatened); Lower Columbia River Chinook salmon ESU (threatened); Upper Columbia River spring-run Chinook salmon ESU (endangered); Columbia River chum salmon ESU (threatened); Snake River sockeye salmon ESU (endangered); Upper Columbia River steelhead ESU (endangered); Snake River Basin steelhead ESU (threatened); Lower Columbia River steelhead ESU (threatened); Middle Columbia River steelhead ESU (threatened); and the Columbia River distinct population segment of bull trout (threatened). Listed fish can be impacted thru a complex web of short and long term processes and over multiple time periods which makes evaluation of this 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. Hatchery steelhead and limited natural production of chinook, coho, chum and steelhead occurs in this system along with non-salmonid fishes (sculpins, lampreys and sucker etc.). Except for yearling coho and steelhead, these species may serve as prey items during the emigration through the basin. These hatchery fish provide an additional food source to natural predators that might otherwise consume listed fish and may overwhelm established predators providing a beneficial, protective effect to co-occurring wild fish. Hatchery releases can also behaviorally encourage mass emigration of multiple species through the watershed, reducing residency. The nutrient enhancement from spawned adults from salmonid and non-salmonid species may contribute nutrients that increase overall productivity in the watershed, reducing inter-species interactions. Many watersheds in the Pacific Northwest appear to be nutrient-limited (Gregory et al. 1987; Kline et al. 1997) and salmonid carcasses can be an important source of marine derived nutrients (Levy 1997). Carcasses from returning adult salmonids elevated 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). Addition of nutrients has been observed to increase the production of salmonids (Slaney and Ward 1993; Slaney et al. 2003; Ward et al. 2003). The Coweeman River drainage is thought to be inadequately seeded with anadromous fish carcasses and steelhead carcasses can be used throughout the basin. Assuming limited non-successful spawning, approximately 50-100 adult carcasses could contribute approximately 500 – 1000 pounds of marine derived nutrients to organisms in the Coweeman system.

4) Salmonid and non-salmonid fishes or species that could be positively impacted by the program. Coweeman steelhead smolts can be preyed upon release through the entire migration corridor from the river subbasin to the mainstem Columbia River and estuary. Northern pikeminnows and introduced spiny rays in the Columbia mainstem sloughs can predate on steelhead smolts as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons. Mammals that benefit from migrating smolts and returning adults include: harbor seals, sea lions, river otters, and Orcas.

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.

Surface water sources for the off-channel ponds are fed from an unnamed creek. The water flows thru the existing off-channel ponds to join the Coweeman River. Water quality parameters (Temperatures and dissolved oxygen measurements) are monitored.

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	The Net Pen Facility meets guidelines not requiring the following permits: "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit (>20,000 lbs total on site production and > 5,000 lbs of fish feed per month). Army Corps of Engineers 404 Permit DOE 401 Water Quality Permit. Intake screening may not meet NMFS guidelines at this time. They are unsophisticated structures of local design. See also rearing facility section 5.5.
Intake/Screening Compliance	
Hatchery effluent discharges. (Clean Water Act)	

Section 5. Facilities

5.1 Broodstock collection facilities (or methods).

See Elochoman Winter Steelhead (Early) HGMP.

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

Not applicable for adult collection.

5.3 Broodstock holding and spawning facilities.

See Elochoman Winter Steelhead (Early) HGMP.

5.4 Incubation facilities.

See Elochoman Winter Steelhead (Early) HGMP.

5.5 Rearing facilities.

Two acclimation off channel ponds are used with Pond No.2 currently not being operated.

The Upper Pond # 1 Acclimation Ponds (Lower Columbia Fly Fishers) is an irregular-shaped earthen pond that is ~60.0 ft. Long X ~30.0 ft Wide X ~7.0 ft Deep. The pond is an impoundment of an unnamed stream that has been created by an earthen dam with screening structure; the stream provides approximately 350-400 gpm of water.

This pond was operationally compromised in 2003. Fish previously acclimated in this pond were direct planted into the Coweeman River.

The Lower Pond # 2 Acclimation Ponds (Lower Columbia Fly Fishers) is an irregular-shaped earthen pond that is ~30.0 ft. Long X ~40.0 ft Wide X ~5.0 ft Deep. The pond is an off-stream impoundment with a gravity supply line (a corrugated pipe~4.0 inches diameter) from an unnamed stream, and centrally located/screened standpipe; the unnamed stream provides approximately 350-400 gpm of water.

5.6 Acclimation/release facilities.

Same, see Section 5.5 above.

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

As fish are transferred in late winter, most severe weather and high water problems are over.

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.

Listed fish are not reared in the program. The Lower Columbia Fly Fishers check the rearing ponds daily and communicate problems to WDFW immediately.

Section 6. Broodstock Origin and Identity

6.1 Source.

The broodstock is representative of adapted winter steelhead populations (Elochoman, Kalama, Lewis, Grays, Washougal Subbasins) that are currently used for hatchery programs within the Lower Columbia ESU. Importing eggs from other facilities is occasionally done when insufficient numbers of eggs are available. Eggs from adults returning to the hatchery are always given priority for on-station use. Program broodstock is collected from hatchery-origin (adipose fin missing). Program broodstock is collected from hatchery-origin (adipose fin missing). The purpose of this isolated program is to provide adult harvest under the selective fishery regulations (retention of adipose clipped fish only). The program harvest is not managed for adult escapement. In case of program broodstock shortage to meet smolt production goals, eyed eggs or juvenile fish for the program can be imported to the Elochoman River Hatchery from other Lower Columbia (Kalama, Lewis, Grays or Washougal River) winter steelhead hatchery programs. See Elochoman Winter Steelhead (Early) HGMP.

6.2.1 History.

See Elochoman Winter Steelhead (Early) HGMP. The winter steelhead stock used at Elochoman Hatchery/Beaver Creek Hatchery was originally from Chambers Creek. The stock was developed during the 1940s from predominantly native Chambers Creek steelhead. The adult return timing of this stock is from mid-November through February, with a strong peak in December and early January. Broodstock sources for the past few years have been from Elochoman and Kalama River early hatchery steelhead.

6.2.2 Annual size.

See Elochoman Winter Steelhead (Early) HGMP. Approximately 50 spawning cohorts are used for Elochoman programs. See Elochoman Winter Steelhead (Early) HGMP

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

See Elochoman Winter Steelhead (Early) HGMP. The level of natural fish in the returning broodstock is unknown prior to 1986. Since that time only hatchery origin broodstock have been used for propagation purposes identified by their missing adipose fin. No natural fish incorporated into broodstock.

6.2.4 Genetic or ecological differences.

See Elochoman Winter Steelhead (Early) HGMP. Beaver Creek winter steelhead pool genetically with other hatchery winter steelhead of common ancestral origin (Chambers Creek in Puget Sound) (Phelps et. al. 1994). Wild winter steelhead in the Lower Columbia cluster with each other and not with Beaver Creek fish (Leider et al. 1996 and Busby et al. 1997). The difference in spawn timing (3 months earlier for Beaver Creek 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 whereas 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). The broodstock is currently derived from hatchery adults returning to the Elochoman River Hatchery.

6.2.5 Reasons for choosing.

See Elochoman Winter Steelhead (Early) HGMP. Production of two-year steelhead smolts is

costly, therefore it was economically beneficial for hatcheries to produce one-year smolts. Since steelhead spawn from January to June, hatchery personnel selected the earliest returning and spawning steelhead to develop the Chambers Creek winter steelhead stock in the 1940's. This stock was transplanted to the lower Columbia when Beaver Creek Hatchery opened in the 1950's. Spawning time and return time are approximately three months earlier for hatchery fish when compared to wild fish. WDFW views these as management opportunities that reduce mixed stocked fishery impacts and genetic risks to wild fish.

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.

- Only hatchery stock is used.
- Timing is separated from natural steelhead.
- Holding pond procedures follow WDFW/IHOT guidelines.
- Other listed fish, if identified, will be released immediately if encountered during the broodstock collection process.

Section 7. Broodstock Collection

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

See Elochoman Winter Steelhead (Early) HGMP.

7.2 Collection or sampling design

See Elochoman Winter Steelhead (Early) HGMP.

7.3 Identity.

See Elochoman Winter Steelhead (Early) HGMP.

7.4 Proposed number to be collected:

7.4.1 Program goal (assuming 1:1 sex ratio for adults):

See Elochoman Winter Steelhead (Early) HGMP.

7.6 Fish transportation and holding methods.

None needed for adults.

7.7 Describe fish health maintenance and sanitation procedures applied.

See Elochoman Winter Steelhead (Early) HGMP.

7.8 Disposition of carcasses.

See Elochoman Winter Steelhead (Early) 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.

- No listed natural fish are used for broodstock collection.
- Timing is separated from listed fish
- Broodstock collection and sorting procedures can quickly identify non-target listed fish if encountered

Section 8. Mating

8.1 Selection method.

See Elochoman Winter Steelhead (Early) HGMP.

8.2 Males.

See Elochoman Winter Steelhead (Early) HGMP.

8.3 Fertilization.

See Elochoman Winter Steelhead (Early) HGMP.

8.4 Cryopreserved gametes.

Not used.

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

See Elochoman Winter Steelhead (Early) HGMP.

Section 9. Incubation and Rearing.

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

See Elochoman Winter Steelhead (Early) HGMP.

9.1.2 Cause for, and disposition of surplus egg takes.

See Elochoman Winter Steelhead (Early) HGMP.

9.1.3 Loading densities applied during incubation.

See Elochoman Winter Steelhead (Early) HGMP.

9.1.4 Incubation conditions.

See Elochoman Winter Steelhead (Early) HGMP.

9.1.5 Ponding.

See Elochoman Winter Steelhead (Early) HGMP.

9.1.6 Fish health maintenance and monitoring.

See Elochoman Winter Steelhead (Early) HGMP.

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

See Elochoman Winter Steelhead (Early) HGMP.

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

See Elochoman Winter Steelhead (Early) HGMP.

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

See Elochoman Winter Steelhead (Early) HGMP.

9.2.3 Fish rearing conditions.

Prior to 2003, in mid March, fish were transferred from the Elochoman Hatchery to the Lower Columbia River Fly Fishers (LCRFF) acclimation ponds located on the Coweeman River (Cowlitz Subbasin) at RM 8.0(lower pond) and RM 10.0(upper pond). These fish were acclimated and volitionally released from the LCRFF upper pond (RM 10) and force released from the lower pond (RM 8) into the Coweeman River at approximately 5.0 fpp during the period of late April-early May. With the operational problems at Pond #1, the 2004 plant (15,000 smolts) was made as a direct river plant.

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.

For the rearing period from February to April at Coweeman Ponds, fish grow from 7-8 FPP to 5.5 FPP (growth rate is 0.091) for the month.

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

Same, see above.

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*).

Feeding is done 4 times a week, one feeding per day to satiation. Moore Clark Trout AB 2.5 mm is used, fed at 0.75 (%B.W./day).

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

Fish populations are monitored by the Lower Columbia Fly Fishers. When any problems are noticed WDFW staff is contacted.

Monitoring	A fish health specialist inspects fish monthly if possible and checks both healthy and if present symptomatic fish. Based on pathological or visual signs by the crew, age of fish and the history of the facility, the pathologist determines the appropriate tests. External signs such as lesions, discolorations, and fungal growths will lead to internal examinations of skin, gills and organs. Kidney and spleen are checked for bacterial kidney disease (BKD). Blood is checked for signs of anemia or other pathogens. Additional tests for virus or parasites are done if warranted.
Disease Treatment	As needed, appropriate therapeutic treatment will be prescribed to control and prevent further outbreaks. Mortality is collected and disposed of at a landfill. Fish health and or treatment reports are kept on file.
Sanitation	All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy). All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots. Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water. Tank trucks are disinfected between the hauling of adult and juvenile fish.

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

Aggressive pond swarming against sloped pond sides, along with a silvery physical appearance and loose scales during feeding events are signs of smolt development. Correspondingly, environmental cues including daylight, increase spike in the water temperature, and spring freshets, which will also be part of the management decision to release fish. ATPase activity is not measured

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

Utilizing off-channel natural ponds exposes fish to increased natural conditions that hatchery concrete raceways or release ponds may not provide that acclimate steelhead to the watershed. Terrestrial and invertebrate food items originating from the natural environment are beneficial to fish as supplemental food sources. Besides providing some natural food, environmental cues through ambient water temperatures and behavioral training such as predator avoidance are also benefits to overall smolt survival.

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.

Natural or listed fish are not used.

Section 10. Release

10.1 Proposed fish release levels.

In past years, releases have ranged from 0 to a high of 51,174 smolts (1994). No more than 20,000 fish is the program goal.

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

Prior to 2003, in mid March, one group of program fish (15000 pre-smolts at ~8 fpp) were transferred from the Elochoman Hatchery to the Lower Columbia River Fly Fishers (LCRFF) acclimation ponds located on the Coweeman River (Cowlitz Subbasin) at RM 8.0 (lower pond) and RM 10.0(upper pond). These fish are acclimated and volitionally released from the LCRFF upper pond (RM 10) and force released from the lower pond (RM 8) into the Coweeman River at approximately 5.0 fpp.

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)
1991	52,698	April 16-May 7	4.0
1992	45,200	nya	nya
1993	46,540	April 21-30	6.0
1994	51,174	April 15-26	5.0
1995	29,300	nya	nya
1996	40,600	nya	nya
1997	41,765	April 15 and May 28	5.0 and 4.0
1998	20,010	April 15-26	nya
1999	21,400	nya	nya
2000	18,200	April 1	5.0
2001	12,000	April 16	5.5
2002	19,800	nya	nya
2003	14,879	Start mid April	5.8

10.4 Actual dates of release and description of release protocols.

Fish are volitionally released from the third week in April to the third week in May. The group of fish in the upper Coweeman Pond is volitionally released by pulling the outlet screen of the pond; this pond is located on small unnamed tributary that is approximately 1/4 of mile upstream of its confluence with the Coweeman River. The group of fish in the lower Coweeman Pond were force released by pulling the centrally located stand pipe of the pond.

which drains the pond water into the larger unnamed tributary of the Coweeman River; this larger unnamed tributary is also located approximately 1/4 of mile upstream of its confluence with the Coweeman River. The release period of group releases is within the outmigration window of naturally produced steelhead trout. The 15,000 fish destined for Pond 1 were direct planted in the unnamed tributary in 2004.

10.5 Fish transportation procedures, if applicable.

For fish planted directly from Elochoman Hatchery (2004), 1000 gallon and 1200 gallon tanker trucks will haul fish from Elochoman and directly release the fish into the Coweeman River. This trip can take approximately 11/2 hours. Tankers are equipped with re-circulating water pumps and oxygen.

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

Until 2003, program fish were transferred in mid-March from the Elochoman Hatchery to the Upper and Lower Columbia River Fly Fishers (LCRFF) Acclimation Ponds located on the Coweeman River at RM 8.0 and 10.0. Transferred site plants on the Coweeman River are acclimated to tributary stream water sources for a period of approximately 2 months prior to release. Operational concerns with Acclimation Pond #1 has resulted in making a direct plant to the Coweeman River in 2004.

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

All fish are mass marked (adipose fin-clipped).

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

Plants into the Coweeman will not exceed 20,000 fish. Hatchery origin smolts, if in surplus numbers, will be planted in local land-locked ponds and lakes.

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. The fish specialist examines affected fish, and recommends the appropriate treatment. Reporting and control of selected fish pathogens are done in accordance with the Co-managers Fish Disease Control Policy and IHOT guidelines.

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

If needed, Lower Columbia Fly Fishers staff notifies the Complex manager of a situation who would contact regional manager to apprise him/her of the situation. Upon approval, the screens/stop logs/sumps would be pulled in order to make emergency on-station release of fish into the Coweeman River. The water system is gravity fed and generally continues to flow during flood events but debris and sediment can interrupt flow.

10.11 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

- The production and release of smolts through fish culture and volitional release practices fosters rapid seaward migration, limiting freshwater interactions with naturally produced Chinook and steelhead juveniles. (*WDFW Steelhead Rearing Guidelines).*

- WDFW uses acclimation and release of smolts in lower river reaches where possible. Smolt releases from this facility mostly occur below known wild fish spawning and rearing habitat in the middle and upper Coweeman River.
- Acclimated pond portion increases survival and reduces potential straying
- Returning hatchery fish are under heavy selective harvest and are identified by Ad clip mark.
- Hatchery stock and wild fish are isolated by timing.
- WDFW proposes to continue monitoring, research and reporting of hatchery smolt migration performance behavior, and intra and interspecific interactions with wild fish to assess, and adjust if necessary, hatchery production and release strategies to minimize effects on wild fish.
- WDFW fish health and operational concerns for Coweeman (Elochoman) Hatchery programs are communicated to Region 5 staff for risk management or needed treatment. See also section 9.7. Listed fish are not released.

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.

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.

Section 12. Research

12.1 Objective or purpose.

Research is not conducted on Coweeman hatchery steelhead but research on the Kalama System could be applied to other systems. Smolt-to-adult survival is being assessed for both hatchery and wild steelhead in the Kalama basin. Multiple methods for estimating smolts out are in use: a subsample of smolts trucked to release sites are carefully weighed to establish average weight of fish being placed in each truckload and the total number of fish is established using the volumetric displacement method. Smolts volitionally leaving the acclimation pond are automatically counted using a commercially available array of counting tubes. Smolt traps fished in the upper watershed and at the Kalama Falls facility estimate migration rates (for wild and hatchery fish) out of the Kalama system. The number of adults back is estimated by counting fish handled at the adult trap at Kalama Falls Hatchery, adding in harvested fish estimated from harvest records, and by performing a comprehensive (mainstem and major tributaries) snorkel survey each year. In future years, after adult offspring of the wild broodstock begin to return, a creel survey will also be conducted.

12.2 Cooperating and funding agencies.

NA

12.3 Principle investigator or project supervisor and staff.

NA

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

NA

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

NA

12.6 Dates or time periods in which research activity occurs.

NA

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

NA

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

NA

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

NA

12.10 Alternative methods to achieve project objects.

NA

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

NA

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

NA

Section 13. Attachments and Citations

13.1 Attachments and Citations

Busack, C., and A. Marshall. 1991. Genetic analysis of YFP chinook salmon stocks. Pages 2-45 in C. Busack, C. Knudsen, A. Marshall, S. Phelps, and D. Seiler. Yakima Hatchery Experimental Design. Progress Report, DOE/BP-00102. Bonneville Power Administration, Portland, OR.

Byrne, J. and H.J. Fuss. 1998. Annual coded-wire tag program Washington: Missing Production Groups. Annual Report 1998. Bonneville Power Administration, Portland, Or. Project Number 89-066. 107 pp.

Crawford, B. A. 1979. The origin of the trout brood stocks of the Washington Department of Game. Washington State Game Department, Fishery Research Report. 77 pp.

Fuss, H.J., J. Byrne, and C. Ashbrook. 1999. Migratory behavior and incidence of post-release residualism of hatchery-reared coho and chinook salmon released into the Elochoman River. Washington Department of Fish and Wildlife, Report No. FPT 99-08.

Fuss, H.J., J. Byrne, and C. Ashbrook. 1999. Migratory behavior and incidence of post-release residualism of hatchery-reared steelhead and cutthroat trout released into the Elochoman River. Washington Department of Fish and Wildlife, Report No. FPT 99-09.

Fuss, H.J., J. Byrne, and C. Ashbrook. 1998. Stock characteristics of hatchery-reared salmonids and Washington Department of Fish and Wildlife Columbia River Hatcheries. Washington Department of Fish and Wildlife, Annual Report H98-03. 65 pp.

Fuss, H.J. and P. Seidel. 1987. Hatchery incubation techniques at WDF hatcheries. Washington Department of Fisheries, Technical Report 100. 86 p.

IHOT (Integrated Hatchery Operations Team). 1995. Operation plans for anadromous fish production facilities in the Columbia River basin. Volume III-Washington. Annual Report 1995. Bonneville Power Administration, Portland Or. Project Number 92-043. 536 pp.

Phelps, S.R., B.M. Baker, P.L. Hulett, and S.A. Leider. 1994. Genetic analysis of Washington steelhead: Initial electrophoretic analysis of wild and hatchery steelhead and rainbow trout. Washington Department of Fish and Wildlife, Report # 94-9. 63 pp.

Washington Department of Fish and Wildlife. 998. Water resource inventory area river mile indices for the Columbia and Snake river basins. Unpublished document. Habitat Management Division, Washington Department of Fish and Wildlife, Olympia, WA.

Washington Department of Fisheries (WDF) and Washington Department of Wildlife (WDW). 1993. 1992 Washington State salmon and steelhead stock inventory - Appendix three Columbia River stocks. Washington Dept. Fish and Wildlife, 600 Capitol Way N, Olympia, WA. 98501-1091. 580 pp.

Washington Department of Fisheries (WDF), Washington Department of Wildlife (WDW), and Western Washington Treaty Indian Tribes (WWTIT). 1992. 1992 Washington State salmon and steelhead stock inventory (SASSI). Washington Dept. Fish and Wildlife, 600 Capitol Way N, Olympia, WA. 98501-1091. 212 pp.

Washington Department of Fish and Wildlife and Western Washington Treaty Indian Tribes. 1998. Co-managers of Washington fish health policy. Fish Health Division, Hatcheries Program. Washington Dept. Fish and Wildlife, Olympia.

Wood, J.W. 1979. Diseases of Pacific Salmon, their prevention and treatment, 3rd edition. Washington Department of Fisheries, Hatchery Division, Olympia, Washington. 82 p.

Piper, R.G. et. al. 1982. Fish Hatchery Management. United States Department of the Interior, Fish and Wildlife Service, Washington D.C. 517 pp.

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:_____