HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Cowlitz River "Early" Winter Steelhead Program
Species or Hatchery Stock:	"Early" Winter Steelhead (Onchorynchus mykiss) Cowlitz River
Agency/Operator:	Washington Department of Fish and Wildlife
Watershed and Region:	Cowlitz River, tributary to Columbia River Washington state
Date Submitted:	April 04, 2001
Date Last Updated:	March 15, 2001

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Cowlitz River "Early" Winter Steelhead Program.

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

Cowlitz River "Early" Winter Steelhead (Onchorynchus mykiss)

1.3) Responsible organization and individuals

Name (and title):	Chuck Johnson, Region 5 Operations Manager Don Peterson, Complex Manager	
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

The Cowlitz Trout Hatchery was constructed by, owned, funded and maintained by Tacoma Public Utilities (TPU). It is operated by the State of Washington Department of Fish and Wildlife (WDFW) to mitigate for the impact of Mayfield and Mossyrock Dams on Cowlitz River salmon and steelhead stocks.

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

Funding for this program is provided through Tacoma Public Utilities.

1.5) Location(s) of hatchery and associated facilities.

Cowlitz Trout Hatchery is located on the Cowlitz River (26.0002), eleven miles east of I-5 near State Highway 12, south of Ethel, Washington at RM 41. Elevation of the facility is 250 feet (76m) above sea level.

1.6) Type of program.

Isolated harvest

1.7) Purpose (Goal) of program.

The goal is to mitigate for the loss of winter steelhead due to the development of the hydroelectric dams in the Cowlitz River basin and to provide harvest opportunities. The current program goal calls for the production and release of 300,000 smolts into the Cowlitz River from the Cowlitz Trout Hatchery.

1.8) Justification for the program.

This program will be operated to provide fish for harvest while minimizing adverse effects on the listed fish. This will be accomplished in the following manner:

1. Hatchery fish will be released as smolts at a time to minimize or eliminate adverse interactions with listed fish.

2. Only appropriate stocks will be propagated.

3. Hatchery fish will be externally marked to distinguish them from wild fish.

4. Fish will be acclimated before release when possible.

5. Hatchery fish will be propagated using appropriate fish culture methods and consistent with the Co-Managers' Disease Policy and state and federal water quality standards.

6. These hatchery fish will be harvested at a rate that does not adversely effect wild fish.

7. Juvenile fish produced in excess to production goals will be dealt with appropriately.

1.9) List of program "Performance Standards".

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

Performance Standards and Indicators for lower Columbia **Isolated Harvest** Steelhead programs.

Performance Standard	Performance Indicator	Monitoring and Evaluation Plan
Produce adult fish for harvest	Survival and contribution rates	Monitor catch and CWT data

Meet hatchery production goals	Number of juvenile fish released	Future Brood Document (FBD) and hatchery records
Manage for adequate escapement where applicable	Hatchery return rates	Hatchery return records
Minimize interactions with listed fish through proper broodstock management and mass marking. Maximize hatchery adult capture effectiveness. Use only hatchery fish	Number of broodstock collected	Stream surveys, rack counts and CWT data
	Stray Rates	
	Sex ratios	Hatchery records
	Age structure	
	Timing of adult collection/spawning	Hatchery records
	Total number of wild adults passed upstream	Spawning guidelines (Tipping?Rawding, "Draft", 1999)
	Adherence to spawning guidelines	
Minimize interactions with listed fish through proper rearing and release strategies	Juveniles released as smolts	FBD and hatchery records
	Out-migration timing of listed fish / hatchery fish	FBD and historic natural outmigration times
	Size and time of release	FBD and hatchery records
	Hatchery stray rates	CWT data and hatchery records (marked vs unmarked)
Maintain stock integrity and genetic diversity	Effective population size	Spawning guidelines (Tipping/Rawding, "Draft", 1999)
	Hatchery-Origin Recruit spawners	Spawning ground surveys

Maximize in-hatchery survival of broodstock and their progeny; and Limit the impact of pathogens associated with hatchery stocks, on listed fish	Fish pathologists will monitor the health of hatchery stocks on a monthly basis and recommend preventative actions / strategies to maintain fish health	Co-Managers Disease Policy Fish health monitoring records
	Fish pathologists will diagnose fish health problems and minimize their impact	
	Vaccines will be administered when appropriate to protect fish health	
	A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings	
	Fish health staff will present workshops on fish health issues to provide continuing education to hatchery staff.	
Ensure hatchery operations comply with state and federal water quality standards through proper environmental monitoring	NPDES compliance	Monthly NPDES records

1.11) Expected size of program.

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

600 adults (300 males and 300 females).

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location. (*Use standardized life stage definitions by species presented in* Attachment 2).

Note: Current program and agreements reflect a mitigation agreement that is valid through December 31, 2001. Re-license negotiations to establish future rearing / release goals are currently ongoing between Tacoma Public Utilities and Washington Department of Fish and Wildlife (WDFW).

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling		
Smolts	Cowlitz Trout Hatchery-Blue Creek	300,000

Note: Cowlitz Trout Hatchery (RM 41)-Blue Creek (WRIA # 26.0899).

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

Source is J. Tipping and D. Harmon, 2000. Cowlitz Fish Biologist Annual Report for 1999. WDFW FP00-09.

Smolt-to-adult return rates by brood year for Cowlitz winter steelhead (smolts planted versus adults harvested). To determine total survivals, the percent return in the table needs to be divided by 0.70 to account for escapement.

Release Year	Smolts Planted	Punchcard Harvest	Adults Harvested/Release	Percent Return
1980	380,420	3,494	4,824	1.27
1981	462,094	5,961	4,471	0.97
1982	323,801	2,847	10,271	3.17
1983	510,156	6,833	14,217	2.79
1984	649,223	16,102	13,334	2.05
1985	698,249	10,989	15,132	2.17
1986	372,169	17,270	10,578	2.84
1987	810,185	11,724	8,014	0.99
1988	523,777	8,651	6,605	1.26
1989	815,224	6,943	8,167	1.00
1990	823,176	5,837	15,092	1.83
1991	769,415	11,848	12,801	1.66
1992	1,178,764	16,173	20,817	1.77

1993	717,744	11,677	8,871	1.24
1994	726,937	23,863	4,805	0.66
1995	631,486	3,874	2,931	0.46
1996	557,358	5,115	2,269	0.41

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

Since 1967.

1.14) Expected duration of program.

Ongoing

1.15) Watersheds targeted by program.

Cowlitz River (26.0002)

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

SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.

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

None.

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

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

- Identify the ESA-listed population(s) that will be directly affected by the program.

None

- Identify the ESA-listed population(s) that may be incidentally affected by the program.

Lower Columbia Steelhead, Lower Columbia Chinook, Lower Columbia Chum, Mid Columbia Steelhead, Upper Columbia Steelhead, Upper Columbia Spring Chinook, Snake River Sockeye, Snake River Chinook, Snake River Steelhead, Willamette Steelhead, Willamette Chinook and Columbia River Bull Trout.

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 (*see definitions in "Attachment 1").*

Critical and viable population thresholds have not been established for the above ESU's and the populations within them. NMFS has formed a Lower Columbia River/Willamette River Technical Review Team to review population status within these ESU's and develop critical and viable population thresholds.

The SASSI report (WDFW) describes the status of winter (early) steelhead in the Cowlitz as "depressed".

- Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.

Source is J. Tipping and D. Harmon, 2000. Cowlitz Fish Biologist Annual Report for 1999. WDFW FP00-09.

Smolt-to-adult return rates by brood year for Cowlitz winter steelhead (smolts planted versus adults harvested). To determine total survivals, the percent return in the table needs to be divided by 0.70 to account for escapement.

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1996	557,358	5,115	2,269	0.41

- Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

Source is J. Tipping and D. Harmon, 2000. Cowlitz Fish Biologist Annual Report for 1999. WDFW FP00-09.

Spawning surveys were conducted for "late" winter steelhead on Monahan Creek which flows into Delameter Creek and Arkansas Creek, and then enters the Cowlitz River below the town of Castle Rock. Monahan Creek was previously surveyed for post-March 15 spawning activity in 1985 (Tipping et al. 1985), 1997, and 1998 (Tipping and Harmon 1999). Observed redds included nine on March 31, four on April 14 and six on April 28, a total of 19. This was only 35% of that observed in 1998 and 1997 and only 15% of that observed in 1985.

Number of "late" winter steelhead redds observed in 1999 in Monahan Creek compared to previous years (after March 15).

Year	Redds
1999	19
1998	54
1997	54
1985	129

- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

No "early" winter steelhead are above Cowlitz Falls dam. It is not possible to determine the number of marked and un-marked steelhead in the lower river and its tributaries because escapement estimates are based on redds and don't include observations of marked and un-marked fish.

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 *(see "Attachment 1" for definition of*

"take").

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

The Cowlitz Salmon and Trout hatcheries, due to pumping large volumes of water, have a potential to take naturally produced steelhead (juveniles/smolts) due to inadequate screening at the pumping facilities. Actual numbers are unknown.

Also, the main attraction feature of the Cowlitz Salmon Hatchery fish ladder is located above the barrier dam adjacent to the fish ladder. It diverts a significant amount of attraction water into the mouth of the fish ladder. This unit has no screening and potential entrainment of listed fish is possible, but fish may vacate through the bar screen. Numbers unknown.

With the release of cutthroat and rainbow trout into the Upper Cowlitz (Tilton River and Skate Creek), there is a potential for some naturally produced winter steelhead juveniles to be taken by these species. The Tilton River and Skate Creek make up only about 1% of the stream area utilized by the winter steelhead. Therefore, take should be minimal to non-existent. Tiger muskie are released into Mayfield Lake and may pose some risk to naturally produced steelhead. However, stomach samples of tiger muskies have not shown the presence of salmonids probably due to habitat segregation and metabolisms. Most tigers are lethargic until mid-May due to cool water temperatures and are found in offshore areas near the bottom. Then they move into shallow weedbeds during the summer. At this time, have only found northern pikeminnows and suckers in their stomachs (Tipping, WDFW, personal communication).

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

Not known.

- 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).
*Complete the appended "take table" (**Table 1**) for this purpose. Provide a range of potential take numbers to account for alternate or "worst case" scenarios.*

See Table 1. at the end of the 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.

Take was modeled as a "worst case" senario and we do not expect to exceed these levels. However, should this happen, NMFS would be consulted immediately.

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.

Lower Columbia Steelhead Conservation Initiative; WDFW Wild Salmonid Policy; IHOT.

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

Mitigation agreement for Cowlitz Hatchery: Tacoma Contract # 5051-86, 06/26/86.

3.3) Relationship to harvest objectives.

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

The releases of adipose-fin clipped "early" winter steelhead provide sport harvest opportunity for anglers in the Cowlitz and lower Columbia rivers. Selective harvest regulations allow only the harvest of adipose-fin clipped steelhead in the lower Columbia River. Below the barrier dam, at the Cowlitz Salmon Hatchery, anglers may harvest only adipose-fin clipped steelhead . "Late" winter steelhead adults with a right ventral fin clip that return to either facility are transported and released in the upper Cowlitz watershed to provide a harvest opportunity for anglers and provide additional spawners for the restoration program. Specific harvest rates for 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.

3.4) Relationship to habitat protection and recovery strategies.

Natural production has been affected by habitat degradation in Cowlitz River tributaries, passage barriers at Mayfield, Mossryrock and Cowlitz Falls Dam, and avian and pinneped

predation in the lower Columbia and Cowlitz Rivers .

3.5) Ecological interactions.

Smolts are released from the Cowlitz Trout Hatchery in May depending upon size and stage of smoltification to minimize travel time from release to salt water entry. Radio tracking of hatchery-origin smolts (from fry plants) collected at the Cowlitz Falls Project, tagged and released from the stress-relief-ponds, indicates these smolts move downstream rapidly at a rate of 20 miles per day (HARZA NW, 1998). Smolts reared at and released from the hatchery may not exhibit the same rate of migration as smolts reared naturally. Competition with native and non-native species in the lower river is considered low. Predators include fish, birds and marine mammals. Avian predators, including the common merganser, double crested cormorant and caspian tern, appear to be the most effective predators on smolts in the lower Cowlitz. Although northern pikeminnows are present, the free flowing characteristics of the lower river and water temperatures during emigration don't suggest that the species poses significant risk to steelhead smolts. Marine mammals may pose a risk in the lower reaches of the Cowlitz as it enters Longview and flows into the Columbia River.

The presence of *Ceratomyxa shasta,* a very virulent fish disease, is a significant source of concern. Direct and indirect mortality from *C. shasta* is a function of genetic make-up, fish health, time of exposure and water temperatures.

Steelhead smolts are not actively feeding throughout emigration, however, some predation has been observed and reported upon fall chinook fry in the Lewis River (Shane Hawkins, WDFW pers. comm.). Steelhead smolts that residualize may actively prey upon other salmonid fry (spring and fall chinook and chum) present in the lower Cowlitz River.

The large releases of hatchery smolts from the Cowlitz Complex over the course of the natural smolt emigration period may attract additional predators yet may also help reduce predation upon natural smolts as predators focus on more susceptible hatchery smolts.

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.

The Cowlitz Trout Hatchery has three sources of water:

1. 9 shallow wells that supply up to 5 cubic feet per second (cfs). Eight are located on the south side of the river and one is on the north side of the river where the hatchery is located. This water is used for initial rearing and to alter water temperature. Water from the North Well has some bacteria and gas problems. Due to this problem, Tacoma Public

Utilities (TPU) has installed power to the South Wells until a system upgrade is completed. In the fall of 2000, the North Well was not utilized and may be abandoned.

2. Ozonated river water: A 20 cfs capacity ozone plant is used to disinfect river water. This water is used from May to late November/ early December to avoid pathogens, primarily *Ceratomyxa shasta* in river water. The ozone plant has a auxiliary electrical generator.

3. Raw river water: Up to 50 cfs. of river water is available for rearing after the ozone plant is shut down (late November, early December.) through planting time (April/May). A auxiliary electrical generator supplies only enough power to operate two of the four 75 horse power pumps.

All water is pumped into basins where it flows to fish rearing ponds by gravity. Due to a short supply, all water is re-used into lower ponds. Some water may be used three times without treating other than minor aeration.

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.

Cowlitz Salmon and Cowlitz Trout hatcheries main intake screens **do not** conform with NMFS screening guidelines to minimize the risk of entrainment of listed juvenile fish. Both hatcheries waste discharge conforms to NPDES criteria and guidelines .

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

The Cowlitz Trout Hatchery has an adult trapping and holding facility that includes a weir and fish ladder in Blue Creek. Adult hold facility consists of three adult ponds @ 10' X 150' X 5' . Fish are hand sorted and handled according to the Cowlitz Complex Adult Fish Handling Protocol. Fish are returned to the river via truck from this facility.

The adult collection facility at the Cowlitz Salmon Hatchery consists of a barrier dam across the Cowlitz River with an associated fish ladder with significant attraction features. The effective length of the barrier weir crest is 318 feet. The fish ladder supplies fish to the sorting, transfer and holding facilities. Adult fish to be transported are held in one of six 643 cubic feet circular tanks at the adult trap and separator. These tanks are designed to hold up to 1,250 pounds of fish. There are two 1,500 gallon tanker trucks capable of hooking to the underside of the circular tanks and receiving fish through displacement of water. This process results in low stress to the adult fish. The trucks are equipped with flumes for planting fish wherever there is adequate access for these trucks

along the river or to the Cowlitz Trout Hatchery adult holding ponds.

The main attraction feature of the Cowlitz Salmon Hatchery fish ladder is located above the barrier dam adjacent to the fish ladder. It diverts a significant amount of attraction water into the mouth of the fish ladder. This diversion has a bar screen with 7/8 in. clear rack bar spacing. Gravity intake control is achieved by use of a vertical slot weir equipped with a motor operated closure gate. This unit has no screening. An auxiliary vertically-slot entrance is provided at the left bank end of the barrier dam for the purpose of attracting fish from the left bank area to the transport area under the barrier and subsequent movement to the ladder facilities.

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

Adult fish, and occasionally juveniles, that are to be transported from the Cowlitz Salmon Hatchery fish separation unit are held in one of six 643 cubic feet circular tanks at the adult trap and separator. These tanks are designed to hold up to 1,250 pounds of fish. There are two 1,500 gallon tanker trucks capable of hooking to the underside of the circular tanks and receiving fish through displacement of water. This process results in low stress to the adult fish. The trucks are equipped with flumes for planting fish wherever there is adequate access for these trucks along the river or to the Cowlitz Trout Hatchery adult holding ponds.

Juvenile fish being released or transferred between facilities utilize the above trucks and the 1,500 gallon fish tanker assigned to the Cowlitz Trout Hatchery. All vehicles have juvenile and adult handling capability. They all have oxygen and recirculating systems. In addition, several smaller tankers with air stones (one 750 gallon, one 1,000 gallon fiberglass tank and several 250 gallon tanks) are utilized for moving fish around and between the facilities. The 1,500 gallon tanker assigned to the trout hatchery has a hydraulic loading boom for loading adults from the trout hatchery adult ponds.

5.3) Broodstock holding and spawning facilities.

The Cowlitz Trout Hatchery has three adult holding ponds @ 10' X 150' X 5 '.

Fish collected at the Cowlitz Salmon Hatchery for broodstock are held in ponds that are 20' X 100' X 5.5'. From the fish ladder separation facility fish can be sorted to two of these ponds. Broodstock can be transferred to a number of other ponds via direct pond to pond transfer or by handling, after anesthesia, in the spawning room and returning to a chosen pond via a return tube.

At the Cowlitz Trout Hatchery fish are sorted, if mature and needed for spawning, to a holding area in one of the adult ponds. From this holding area the females are killed and placed on a drying rack out of the pond. After the eggs are taken, males are netted up and

placed into a small holding container into which carbon dioxide is diffused. Once the males are anesthetized, they are live spawned and then returned to the pond.

5.4) Incubation facilities.

The Cowlitz Trout Hatchery has 88 shallow trough incubators (the Cowlitz Salmon Hatchery has 272 stacks of vertical stack (Heath Techna) incubators that are badly in need of replacement). Current re-license proposal by TPU calls for replacing these with 140 new vertical stack incubators.

5.5) Rearing facilities.

The Cowlitz Trout Hatchery has 88 shallow trough incubators, 6 fry raceways @ 10' X 90' X 2.5 ', 24 raceways @ 20' X 90' X 2.5' , 3 five acre lakes, one 2.5 acre lake and three adult holding ponds @ 10' X 150' X 5' . The river intake is able to supply 50 cfs of river water or 20 cfs while the ozone plant is operating. The well pumps are capable of supplying an additional 5 cfs. The ozone plant is the first one designed specifically for hatchery use. This plant is capable of producing 200 pounds of ozone daily.

5.6) Acclimation/release facilities.

Winter steelhead are reared in raceways at the Cowlitz Trout Hatchery and the smolts must be trucked out of these ponds to be released. The raceways at the trout hatchery have no outlet to the river for fish release. Water discharged from the raceways can be routed to the adult ponds, the rearing lakes or the pollution abatement ponds, but not directly to the river. Therefore, fish are planted via truck at the boat ramp at the Cowlitz Trout Hatchery.

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

Outbreaks of *Ceratomyxa shasta* have caused some significant fish mortality in the past. Installation of a ozone treatment facility in 1994 has decreased mortality significantly.

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.

Safeguards to insure a uninterrupted water supply at the Cowlitz Trout Hatchery include auxiliary power to supply two of the four river water intake pumps, the north well and the ozone plant. All water sources and head boxes of all raceways are equipped with low water alarms. The water intake structure also has an alarm for the river water, south well water and the north well water. All wells and river pumps are also alarmed.

The river water is a source of numerous pathogens. This water is disinfected by the ozone plant during the warmer rearing months. Since water is re-used between numerous ponds the possibility for the spread of infection is inherent at the facility. Normal fish culture hygiene is practiced. Flooding and muddy water occasionally occurs even though the river level is controlled by three dams.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.

Marked "early" winter steelhead adults returning to the Cowlitz River Trout Hatchery.

6.2) Supporting information.

6.2.1) History.

The origin of the broodstock used today is a combination of Chambers Creek, Elokomin River stock and Cowlitz River steelhead.

6.2.2) Annual size.

600 hatchery-origin, adipose fin clipped adults

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

No natural-origin fish are used for broodstock.

6.2.4) Genetic or ecological differences.

Genetically different from indigenous stock(Steve Phelps, WDFW personal communication).

6.2.5) Reasons for choosing.

To provide harvest opportunity while minimizing genetic and ecological risks to natural fish. Locally adapted and appear to be unique from Chambers and Elokomin stocks (Steve Phelps, WDFW, personal communication).

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.

No listed natural fish are selected for broodstock.

SECTION 7. BROODSTOCK COLLECTION

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

Adults.

7.2) Collection or sampling design.

1. Broodstock will be retained for spawning from December 7 through January. New fish will be recruited into the spawning population throughout this time period. Males will be used once, opercule punched, and returned to river. Fish prior to December 7 will not be used as broodstock and will be identified with a opercule punch.

2. There will be no selection for size or age, all selection random.

3. Spawning will occur from December (50%) through January(50%) and will be completed by January 31.

4. Natural-origin or un-marked fish will not be used for spawning.

5. Prior to spawning all collected fish are sorted by species, sex , new, previously recycled, natural (unmarked) and either returned to river, saved or placed in resident water depending on policy.

7.3) Identity.

Collection of early and late winter steelhead is separated by 2 months to avoid mixing. Hatchery fish are separate from natural fish by the occurrence of an adipose-fin clip. Natural fish are very rare, most seasons none are found at the Cowlitz Trout Hatchery.

7.4) Proposed number to be collected:

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

600 adults (300 males and 300 females).

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

Year	Adults				
	Females	Males	Jacks	Eggs	Juveniles
1988					
1989					
1990					
1991					
1992					
1993					
1994					
1995	413	413		1,665,000	
1996	398	278		1,653,000	
1997	385	208		1,641,400	
1998	207	194		900,000	
1999	223	223		936,600	

Data source: (Link to appended Excel spreadsheet using this structure. Include hyperlink to main database)

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

Adults surplus to hatchery needs are returned to the river to increase recreational opportunity (Up to 1,000 adults have been placed in the Tilton River above Mayfield dam).

7.6) Fish transportation and holding methods.

Fish are held in trap (100' x 10') until sorted weekly. Then desired fish are placed into separate sections of a holding raceway. Sections are divided by picket racks. Fish are then sorted weekly to determine ripeness. Holding mortality of winter steelhead is less than 2%.

Adult fish that are to be transported from the Cowlitz Salmon Hatchery fish separation unit are held in one of six 643 cubic feet circular tanks at the adult trap and separator. These tanks are designed to hold up to 1,250 pounds of fish. There are two 1,500 gallon tanker trucks capable of hooking to the underside of the circular tanks and receiving fish through displacement of water. This process results in low stress to the adult fish. The trucks are equipped with flumes for planting fish wherever there is adequate access for these trucks along the river or to the Cowlitz Trout Hatchery adult holding ponds.

7.7) Describe fish health maintenance and sanitation procedures applied.

Standard fish health protocols, as defined in the Co-Managers Fish Health Manual (WDFW 1996), are adhered to.

7.8) Disposition of carcasses.

Spawned carcasses of winter steelhead are considered inedible. Carcasses are buried. Presently no carcasses are provided for nutrient enhancement, primarily due to disease (IHNV) concerns.

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.

Any un-marked fish in holding area is returned to the river in a manner not to harm them. Only adipose-fin clipped adults are used in the broodstock collection program.

SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1) Selection method.

1. Broodstock will be retained for spawning from December 7 through January. New fish will be recruited into the spawning population throughout this time period. Males will be used once, opercule punched and returned to river.

2. There will be no selection for size. All fish will be randomly selected for spawning. Remaining fish are recycled back to the river.

3. Spawning will occur from mid December (50%) through January(50%) and will be completed by January 31.

4. Natural (unmarked fish) will not be used for spawning.

8.2) Males.

Males are used once, marked with an opercule punch, and returned to the river to enter the sport catch.

8.3) Fertilization.

Beginning with the 2000 brood spawning (December 1999), all spawning is one male to one female. Sperm is added to eggs from one female and after five minutes, the fertilized

eggs are disinfected and water hardened in an iodine solution for one hour. After the one hour period, the eggs are combined into 5 fish pools and placed in shallow troughs to incubate.

8.4) Cryopreserved gametes.

None 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.

Un-marked fish are not used in the gene pool.

SECTION 9. INCUBATION AND REARING -

Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1) Incubation:

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

Refer to section 7.4.2 (Table).
Survivals to eye-up average 92%.

9.1.2) Cause for, and disposition of surplus egg takes.

Take more winter-run steelhead eggs to make up for shortfall of "late" run winter steelhead. Also, to safeguard against potential incubation losses. If no shortfalls occur, eggs will be destroyed.

9.1.3) Loading densities applied during incubation.

Eggs from five fish per basket (in shallow trough) until eyed then 20,000 - 21,000 eggs per trough for hatching. Egg size varies from 3,250 to 3,500 per pound.

9.1.4) Incubation conditions.

Normally not routinely monitored. Oxygen level in troughs 8.1 parts per million (ppm) .

9.1.5) Ponding.

At 10 days after swim up (volitional), in trough, fish are fed at about 2,000 fish per pound (fpp) Ponding occurs when fish are from 1,500 fpp to 600 fpp depending on pond space. Lengths are not measured. Ponding begins in mid-February continuing into May.

9.1.6) Fish health maintenance and monitoring.

Diseases occurring in fry are: Bacterial Cold Water disease and Trichodina. Normal yolk-sac development. Standard fish health protocols, as defined in the Co-Managers Fish Health Manual (WDFW 1996), are adhered to.

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.

No listed fish are incubated, but there is a back-up generator to provide power for hatchery pumps in the event of a power loss.

9.2) Rearing:

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 (1988-99), or for years dependable data are available..

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

Fish are started in concrete troughs with 6.9 cubic ft. of water capacity loaded with a average of 20,000 fry. Water flow in troughs is 10 gallons per minute (gpm). Rearing containers are concrete raceways of either 10' X 90' or 20' X 90' and 5.0 or 2.5 acre rearing ponds. The 10" wide raceways are started with up to 200,000 fish at 1,500 fpp. Twenty foot wide raceways are started with 400,000 fish maximum at 700 fish per pound. Water is one-time pass through in the ten foot wide raceways, but is re-use water in the 20 foot wide raceways. As fish increase in size the numbers are reduced to a final loading of 35,000 - 40,000 fish per 20 foot wide raceway. Ten foot wide raceways are not used at final grow out. Rearing ponds receive fresh and previously used water. Loading is presently 350,000 fish in the 5.0 acre lakes and 150,000 fish in the 2.5 acre lake.

9.2.3) Fish rearing conditions

Oxygen levels are normally greater than 10 ppm incoming. Temperatures range between 40 -54 degree Fahrenheit at both facilities.

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.

At release, goal is 180 millimeters (mm) or greater in fork length. Fish have averaged 4.5-5 fpp with a .98 condition factor.

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program*

***performance*), if available**.

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*).

Fish are fed a dry diet by hand and with response feeders. Conversion will vary from 0.6:1 initial in troughs to 1.2:1 in rearing lakes.

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

Fish are routinely monitored by a fish health specialist. Fish are also observed daily by the hatchery staff. When a disease is detected the fish health specialist examines, diagnosis or sends to a laboratory, and prescribes treatment.

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

Not applicable.

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

The project biologist has studied rearing fish in rearing lakes with submerged structure. Results pending return of adults.

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.

No listed fish under propagation.

SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

10.1) Proposed fish release levels. *(Use standardized life stage definitions by species presented in **Attachment 2**. "Location" is watershed planted (e.g. "Elwha River").)*

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling				
Smolts	300,000	4.5-5 fpp	April 15-May 20	**

**- Fish are released into Blue Creek at RM 0.5 and the Cowlitz River at RM 41 (Cowlitz Trout Hatchery).

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

Stream, river, or watercourse: Blue Creek (26.0899) and Cowlitz River (26.0002)
Release point: Blue Creek at RM 0.5, Cowlitz River RM 41
Major watershed: Cowlitz River
Basin or Region: Columbia River

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

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Smolts	Avg size
1988								
1989								
1990								
1991								
1992								
1993								
1994								
1995							781,660 (S) 108,773 (Y)	6.59 10.88
1996							704,133 (S) 102,775 (Y)	7.54 11.18
1997							853,858 (S) 80,413 (Y)	7.39 14.27
1998							773,899 (S) 205,812 (Y)	7.05 12.78
1999							676,868 (S) 61,291 (Y)	7.40 11.88
Average							758,084 (S) 111,813 (Y)	7.19 12.20

Data source: (Link to appended Excel spreadsheet using this structure. Include hyperlink to main database)

(S) - Smolt (<10 fish/pound)
(Y) - Yearling (<20 fish/pound)

10.4) Actual dates of release and description of release protocols.

Release begins April 15 and is completed by May 20. Hatchery reared releases start out as volitional (screen is removed and fish allowed to migrate out on own). Fish that do not leave volitionally are forced out when lake is lowered and drained in May. All raceway reared fish are trucked out to RM 41. Release directly from the raceways is not possible.

10.5) Fish transportation procedures, if applicable.

Juvenile fish being released, as well as being transferred between facilities, utilize the two 1,500 gallon tanker trucks capable of hooking to the underside of the circular tanks and receiving fish through the displacement of water and the 1,500 gallon fish tanker assigned to the Cowlitz Trout Hatchery. They all have oxygen and recirculation systems. In addition, several smaller tankers with air stones (one 750 gallon, one 1,000 gallon fiberglass tank and several 250 gallon tanks) are utilized for moving fish around and between the facilities.

10.6) Acclimation procedures.

The fish are reared at the Cowlitz Trout Hatchery on river water.

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

All fish are adipose-fin clipped prior to release. The hatchery evaluation biologist may have additional marks or tags to identify specific study groups.

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

Plant into local (within basin) waters as directed by Fish Management..

10.9) Fish health certification procedures applied pre-release.

Fish are inspected by a member of the fish health section periodically through out the on-site rearing, prior to off-site shipping, prior to release to the river, and any time abnormal behavior or mortality is noted. Fish are treated with approved chemicals or modification to rearing to alleviate noted problems. Ponds are cleaned on average every other day throughout their rearing. Effluent from cleaning goes into a pollution abatement pond.

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

Fish would not be purposely released during flooding unless the water system failed. At the Cowlitz Trout Hatchery the lakes can be released directly to the river, but fish in the raceways would need to be pumped to trucks or to the river. Due to the large number of ponds time would be limited at both facilities.

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.

Fish released as smolts to decrease residence time in freshwater and reduce interaction with listed fish. All fish released are marked.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

See Section 1.10 (Annual reports to describe M & E taking/took place).

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

11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

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.

SECTION 12. RESEARCH

12.1) Objective or purpose.

12.2) Cooperating and funding agencies.

12.3) Principle investigator or project supervisor and staff.

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

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

12.6) Dates or time period in which research activity occurs.

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

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

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

12.10) Alternative methods to achieve project objectives.

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

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

SECTION 13. ATTACHMENTS AND CITATIONS

IHOT (Integrated Hatchery Operations Team). 1996. 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.

Washington Department of Fish and Wildlife. 1997. Annual mitigation report. Cowlitz Hatchery Complex for January 1, 1997 to December 31, 1997. Section Three: Cowlitz Trout Hatchery mitigation report 1997. Pp. 3-1 thru 3-56.

Washington Department of Fish and Wildlife, 1996. Fish Health Manual. Hatcheries Program, Fish Health Division, Washington Department of Fish and Wildlife, Olympia.

Seidel, Paul, 1983, Spawning Guidelines for Washington Department of Fish and Wildlife Hatcheries, Washington Department of Fish and Wildlife, Olympia.

Piper, Robert, et. al., 1982, Fish Hatchery Management; United States Dept of Interior, Fish and Wildlife Service, Washington, DC.

Piper, Robert, et. al., 1982, Fish Hatchery Management; United States Dept of Interior, Fish and Wildlife Service, Washington, DC.

SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the foregoing information 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:_____

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

Listed species affected: Steelhead ESU/Population: lower Columbia Steelhead **Activity:Hatchery Operations**				
Location of hatchery activity: Cowlitz Salmon & Trout Hatcheries Dates of activity: October-May Hatchery program operator: WDFW				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)			200	
Capture, handle, and release c)			200	
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)		Unknown	20	
Other Take (specify) h)				

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

Instructions:

1. An entry for a fish to be taken should be in the take category that describes the greatest impact.
2. Each take to be entered in the table should be in one take category only (there should not be more than one entry for the same sampling event).
3. If an individual fish is to be taken more than once on separate occasions, each take must be entered in the take table.

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

Listed species affected: Chum ESU/Population: lower Columbia Chum **Activity:Hatchery Operations**				
Location of hatchery activity: Cowlitz Salmon & Trout Hatcheries Dates of activity: October-May Hatchery program operator: WDFW				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)			Unknown	
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)		Unknown	Unknown	
Other Take (specify) h)				

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

Instructions:

1. An entry for a fish to be taken should be in the take category that describes the greatest impact.
2. Each take to be entered in the table should be in one take category only (there should not be more than one entry for the same sampling event).
3. If an individual fish is to be taken more than once on separate occasions, each take must be entered in the take table.

Note: Potential chum returns to the Cowlitz Salmon Hatchery Barrier Dam trap and Cowlitz Trout Hatchery will provide the opportunity to conduct non-lethal tissue sampling. Opportunistic tissue sampling of pre and post-spawning chum or mortalities

(tissues taken for allozyme analysis) will provide base line genetic data that will improve knowledge of this stock. Tissue sampling will consist of taking a small portion (1 square cm) of the anal or caudal fin for DNA analysis.

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

Listed species affected: Chinook ESU/Population: lower Columbia Chinook Activity: Hatchery Operations				
Location of hatchery activity: _Cowlitz Salmon & Trout Hatcheries_ Dates of activity: October - May Hatchery program operator: WDFW _____				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)			Unknown	
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)		Unknown	Unknown	
Other Take (specify) h)				

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

Instructions:

1. An entry for a fish to be taken should be in the take category that describes the greatest impact.
2. Each take to be entered in the table should be in one take category only (there should not be more than one entry for the same sampling event).

3. If an individual fish is to be taken more than once on separate occasions, each take must be entered in the take table.