HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Cowlitz River Fall Chinook Program
Species or Hatchery Stock:	Fall Chinook *(Oncorhynchus tshawytscha)* Cowlitz River
Agency/Operator:	Washington Department of Fish and Wildlife
Watershed and Region:	Cowlitz River, tributary to lower Columbia River Washington state
Date Submitted:	April 04, 2001
Date Last Updated:	March 12, 2001

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Cowlitz River Fall Chinook (Cowlitz Salmon Hatchery) Program

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

Cowlitz River Fall Chinook Salmon *(Oncorhynchus tshawytscha)*

1.3) Responsible organization and individuals

Name(and title):	Chuck Johnson, Region 5, Hatchery 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 Salmon Hatchery was constructed by, and is 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 stocks.

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

Funding for this program is provided through Tacoma Public Utilities (TPU).

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

Cowlitz Salmon Hatchery is located on the Cowlitz River (WRIA 26.0002), eleven miles east of I-5 near State Highway 12, south of Salkum, Washington at river mile (RM 49). Elevation of the facility is 250 feet (76m) above sea level.

1.6) Type of program.

Integrated Harvest

1.7) Purpose (Goal) of program.

Mitigation

The goal of this program is to mitigate for the loss of fall chinook salmon that would have been produced naturally in the Cowlitz River system in the absence of hydroelectric dams built in the Cowlitz River basin.

1.8) Justification for the program.

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

1. Release fall chinook as smolts with expected brief freshwater residence.

2. Time of release not to coincide with out-migration of listed fish.

3. Only appropriate stock will be propagated.

4. Hatchery fish will be propagated using appropriate fish culture methods and consistent with Co-Managers Fish Health Policy and state and federal water quality standards; e.g. NPDES criteria.

5. Mark all reared fish.

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 River **Integrated Harvest** Chinook programs.

Performance Standard	Performance Indicator	Monitoring and Evaluation Plan
Produce adult fish for harvest	Survival and contribution rates	Monitor catch and measuring survivals by periodical CWT data.

Meet hatchery production goals	Number of juvenile fish released	Estimating number of fish planted (weighing / counting fish), monitoring proximity to hatchery production goals, number released recorded on hatchery divisions "plant reports", data available on WDFW data base. Future Brood Document (FBD).
Manage for adequate escapement	Hatchery and wild return rates Catch rates	Monitoring hatchery/wild return rates through trapping (at the hatchery or at weir), spawning ground surveys plus catch records.

Minimize interactions with listed fish through proper broodstock management	Total number of broodstock collected	Measuring number of fish actually spawned and killed to meet egg take goal at the hatchery. Hatchery records.
	Sex ratios	Hatchery records
		Start trapping prior to historical start of the run, continue trapping throughout the run, dates and times are recorded on hatchery divisions "adult reports", data available on WDFW data base.
	Timing of adult collection	
	Number of listed fish passed upstream	Hatchery records.
	Hatchery stray rate	CWT data and spawning ground surveys
	Number wild fish used in broodstock	Hatchery records
	Return timing of hatchery / wild adults	Hatchery records
	Adherence to spawning guidelines	Spawning guidelines

Minimize interactions with listed fish through proper rearing and release strategies	Juveniles released as smolts	FBD and hatchery records
	Outmigration timing of listed fish / hatchery fish	Hatchery records and historical natural out-migrant data
	Size and time of release	FBD and hatchery records
	Hatchery stray rates	CWT data and mark / unmarked ratios of adults
Maintain stock integrity and genetic diversity	Effective population size	Spawner surveys
	Hatchery-Origin Recruit spawners	
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 Exam Reports
	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).

4,480 adults.

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).

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling	Cowlitz River RM 49 (26.0002)	5,000,000
Yearling		

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

Cowlitz River fall chinook natural spawning escapements:

Year	Abundance estimate
1988	7,700

1989	7,220
1990	2,698
1991	2,567
1992	2,489
1993	2,218
1994	2,512
1995	2,231
1996	1,602
1997	2,710
1998	2,108
1999	997

Smolt-to-adult survival rates for Cowlitz fall chinook:

Broodyear	Type of Release	% Survival (Avg.)
1987	Fingerling (0+)	.05
1988	Fingerling (0+)	.11
1989	Fingerling (0+)	.09
1990	Fingerling (0+)	.18
1991	Fingerling (0+)	.08
1992	Fingerling (0+)	.11
1993	Fingerling (0+)	.11
1994	Fingerling (0+)	.01
1995	Fingerling (0+)	.01

For hatchery broodstock collection numbers see section 7.4.2

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

1967.

1.14) Expected duration of program.

Ongoing.

1.15) Watersheds targeted by program.

Cowlitz River (WRIA 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, Upper Willamette Steelhead and 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 fall chinook in the Cowlitz as "healthy".

- 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.

Unknown.

- 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.

See section 1.12

- 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.

Unknown.

2.2.3) <u>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</u> *(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.

WDFW does not pass or release fall chinook above the barrier dam, however some adult fall chinook may jump the barrier dam and some natural production may occur between the barrier and Mayfield dam. The diversion and water intake structure for the Cowlitz Salmon Hatchery is located adjacent to and immediately upstream of the barrier dam and is not completely screened. There is some potential risk that some naturally produced fall chinook juveniles could be taken should they enter this structure.

The water diversion and pump intakes at the salmon hatchery does not have adequate screens and may also pose a potential risk to naturally produced fall chinook.

- 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.

- 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 "take tables" at end of document.

- 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" scenario 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.

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 (Agreement Number FERC PROJECT # 2016 dated Aug. 9, 1967) which requires Tacoma Public Utilities (TPU) to produce sufficient production to achieve 8,300 adult fall chinook to the Cowlitz Salmon Hatchery Fish Barrier (as counted at the fish ladder separation facility).

Cowlitz Falls Fishery Management Plan; Cowlitz Relicensing Settlement Agreement

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.

Cowlitz fall chinook are harvested usually less than 10%. For fall chinook stocks in all fisheries, sport and commercial (mainstem and tributaries), it is estimated the maximum harvest rate is 65%. This is the Recovery Exploitation Rate of which criteria was developed by NMFS. This fall chinook harvest regime is consistent with maintaining and rebuilding populations by regulating tributary fisheries to meet the Recovery Exploitation Rate. This interim regime will change with WDFW moving toward selective fisheries for fall chinook. if funding, technology and co-manager agreement can take place.

3.4) Relationship to habitat protection and recovery strategies.

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

3.5) Ecological interactions.

The lower Cowlitz River downstream of the barrier dam is an important production area for naturally produced fall chinook. Hatchery-origin fall chinook released into the lower Cowlitz may compete with natural-origin fall chinook for food and space. Studies of naturally produced fall chinook are planned as part of the new Cowlitz Hydro Settlement Agreement. Hatchery-origin fall chinook fingerlings may provide a temporary food source for wild steelhead and cutthroat trout smolts. Once hatchery-origin fall chinook are mass marked, interactions between natural (unmarked) and hatchery-origin (marked) fall

chinook may be better studied and understood.

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 hatchery is supplied from three sources. The majority of water is supplied from the Cowlitz River with an average 75,000 gallons per minute (gpm) available to the rearing ponds. An additional 15,000 gpm is available for the fish separator and ladder. The other two sources are "C-wells" (1,000 gpm) and "PW–wells"(700 gpm). The wells are used between August and April, normally for egg incubation and early fry rearing. TPU has a 211 cubic feet per second (cfs) water right at the Cowlitz Salmon Hatchery. An additional water right of 8 cfs was obtained for the BPA funded Stress Relief Ponds (SRP) for utilization with the upper Cowlitz River Restoration Project.

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

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

The adult collection facility at the Cowlitz Salmon Hatchery consists of a barrier dam across the river with an associated fish ladder. Fish move up the ladder to the sorting, transfer and holding facilities. Adults can be sorted to holding ponds that are 20' X 100' X 5.5'. They can also be transferred to a number of other ponds via transfer tube.

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

There are two 1,500 gallon tank trucks able to transport adults that both have oxygen and re-circulating systems. These trucks are equipped with flumes for planting fish wherever there is adequate access. In addition, several smaller tankers with air stones (one 750 gallon, one 1,000 gallon and several 250 gallon tanks) are utilized for moving fish around the facilities.

5.3) Broodstock holding and spawning facilities.

Fish collected at the Cowlitz Salmon Hatchery for broodstock are held in ponds that are

20' X 100' X 5.5'. From here they can be transferred from the ponds to the spawning room where they can be checked for ripeness, anesthetized and spawned or returned to a holding pond via a return tube (if not ripe).

5.4) Incubation facilities.

There are 272 stacks of vertical incubators (Heath Techna). TPU proposal calls for replacing these with 140 stacks of new vertical stack incubators. Each stack consists of 16 trays which are divided into two 1/2 stacks of 8 trays with separate water supplies.

5.5) Rearing facilities.

The Cowlitz Salmon Hatchery has 36 modified Burrows ponds measuring 20' X 100' X 8' with 1800 - 2400 gpm and 17 ponds (kettles) measuring 5' X 100' X 8' with ~ 400 gpm for starting fish and one kettle modified to operate at 4' water depth with ~ 300 gpm flow.

5.6) Acclimation/release facilities.

Releases are from rearing ponds discharging into wasteways that flow into the Cowlitz River upstream of the fish barrier dam.

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

No operational difficulties or disasters have led to significant fish mortality at the facility. There have been higher losses in the incubators due to poor water quality and the inability to treat with appropriate therapeutics, but no significant mortality due to disasters or operational problems.

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.

Tacoma Public Utilities upgraded its electrical service at the Cowlitz Salmon Hatchery in the summer of 1999 including a new electrical service line from the Lewis County Power Supply Line. A new 1.5 KBW generator with upgraded switching equipment was also installed in 1999. The new generator is capable of suppling the power previously supplied by the three previous generators combined. Tacoma Public Utilities has retained the 600 KW generator and switching equipment in case the new generator should ever fail. Tacoma Public Utilities staff maintains the facility. Tacoma Public Utility staff and Washington Department of Fish and Wildlife Staff test the emergency systems weekly.

In event of system failure, there is an extensive alarm system capable of identifying problems in critical areas of the hatchery. At the stress relief ponds, water is stored in empty ponds for flushing in case fish need to be released due to lack of flow.

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.

Adults returning to the Cowlitz Salmon Hatchery.

6.2) Supporting information.

6.2.1) History.

Cowlitz River fall chinook have been collected for brood stock at Cowlitz Salmon Hatchery since 1967.

6.2.2) Annual size.

4,480 adults collected each year. No estimates can be made on the proportion of natural fish used for broodstock in the past.

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

Not known.

6.2.4) Genetic or ecological differences.

None known.

6.2.5) Reasons for choosing.

Indigenous stock.

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.

Fish are collected throughout the entire run to maintain the genetic integrity and diversity of this stock of fish.

SECTION 7. BROODSTOCK COLLECTION

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

Adults.

7.2) Collection or sampling design.

Fish are collected fish throughout the entire run to meet specific fish management objectives and maintain the genetic integrity of this stock Presently, adults for broodstock are collected from August through November, (sometimes December). At the base of the barrier dam (designed to stop/reduce all adult fish migration upstream) is a fish ladder leading to a trap and a fish separator. Adults can be sorted/separated into appropriate ponds for holding until spawned.

7.3) Identity.

In the past, a group of 200,000 fall chinook were adipose-fin clipped/coded-wire tagged for the Columbia River Index. Recently, the same protocol was followed for monitoring Cowlitz fall chinook under Section 10, ESA. Fall chinook is currently the only production group not being mass marked, (currently rearing 1999 brood).

7.4) Proposed number to be collected:

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

4,480 adults (2,240 males and 2,240 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	1,640	1,490	66	7,376,000	
1996	2,041	2,226	18	9,162,000	
1997	1,437	839	20	6,381,000	
1998	1,000	994	20	4,239,800	
1999	1,358	1,393	21	6,809,000	

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.

In the 90's all hatchery-origin fish were spawned or, in 96' only, recycled back downstream or upstream to the Tilton River. No fall chinook are recycled upstream so outmigration studies at the Cowlitz Falls dam can focus on spring chinook.

7.6) Fish transportation and holding methods.

Fish used for broodstock are held in ponds that are 20' X 100' X 5.5'. From here they can be transferred from the ponds to the spawning room where they can be checked for ripeness, anesthetized and spawned or returned to a holding pond via a return tube (if not ripe).

7.7) Describe fish health maintenance and sanitation procedures applied.

All equipment used for broodstock collection is sanitized using an iodine solution.

7.8) Disposition of carcasses.

Presently, all spawned carcasses and mortalities are buried at a Tacoma Public Utilities upland site. Spawned carcasses are not, at this time, utilized for nutrient enhancement.

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.

The risk of fish disease amplification will be minimized by following the Co-Managers' Fish Health Policy. Also, fish are collected throughout the entire run to maintain the genetic integrity and diversity of this stock of fish.

SECTION 8. MATING

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

8.1) Selection method.

Fish are collected throughout the entire run to meet specific fish management objectives and maintain the genetic integrity of this stock of fish. Fish are selected randomly and spawned from September through early December.

8.2) Males.

Males are normally used once except when the following occurs; when too few males per

ripe females exist then they are live spawned and returned to pond (occasionally occurs at the first and last spawnings) .

8.3) Fertilization.

Equal sex ratios and 1:1 matings with pooled gametes from 2 females and 2 males (refer to previous section for additional information when 1:1 ratio does not exist). After water (pathogen free) is added to enhance fertilization, the fertilized eggs from each female are disinfected and water hardened in an iodine solution for one hour. After the one hour period, the eggs are placed in the incubators. Every season, 60 ovarian fluid samples are taken to check for IHNV. ELISAs are done on all females and, during picking, eggs are isolated according to ELISA values. "Below-low" ELISA designations are ponded and reared separately. Various combinations of spring chinook with low, moderate and high ELISA values are reared from year to year in one or two rearing units, segregated from all fish with "below-low" ELISAs.

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.

Fish are collected throughout the entire run and selected randomly to maintain the genetic integrity of this stock of fish.

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 for number of eggs taken for broodyears 1995-1998 (as well for 1999).

Survival to eye-up for 1995-1998:

Brood Year	% Survival
1995	90.6
1996	89.5
1997	90.2
1998	98

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

Over the last decade, fall chinook have been typically planted from entire egg takes. Numbers of fingerlings planted have typically been below numbers programmed, with the exception of the 1996 brood juveniles.

In the case of the 1996 brood juvenile plants; 14,648 were transferred to biologists for use upstream of the hatchery, 252,807 were planted into Riffe Lake to eliminate them from anadromous production and 6,921,736 were released from the hatchery.

Often, production goals are not met. High estimated numbers of eggs are taken when possible to compensate for loss in incubators and/or in rearing prior to release.

9.1.3) Loading densities applied during incubation.

Fall chinook eggs are typically 1,630 eggs/pound (lb.). Standard loading per Heath tray at eyeing is 7,000 eggs/tray. Heath vertical incubators consist of 16 trays divided into two 1/2 stacks of 8 trays. Each half-stack has a separate water supply at 3 gpm. Fry are incubated at 5 gpm and confined in ConWed substrate to discourage excessive swimming. Water flow to fry below 6 gpm is known to reduce or eliminate Bacterial Cold Water Disease (BCWD) in the early life history of salmon in vertical incubators.

9.1.4) Incubation conditions.

Typically, in an ½ stack (8 trays) incubation unit with eggs, influent water to top tray has a dissolved oxygen (DO) content of 11 parts per million (ppm) while the effluent water at bottom tray has ~9 ppm at < 50 degrees Fahrenheit. Influent total gas continues to be variable and sometimes unacceptably high depending upon well and other water sources. Total gas in influent water in the header trough has exceeded 113% and influent water is typically above 100% saturation as measured by HARZA N.W. and the Cowlitz crew.

9.1.5) Ponding.

Fall chinook fry are ponded when less than 1 millimeter (mm) of yolk is showing. They typically have accumulated ~1780 Temperature Units (TU's), are ~990 fish per pound (fpp) and are ~37 mm long. At the Cowlitz Salmon Hatchery these fish are usually ponded between mid-December and mid-April. This range is due to a wide range of egg take dates. Ponding is forced, as Heath incubators do not lend themselves to volitional ponding of swim-up fry.

9.1.6) Fish health maintenance and monitoring.

Salmon Saprolegniasis (fungus) is the primary concern during incubation requiring daily treatments with formalin at 1:600 for 15 minutes. Water flow to fry is kept below 6 gpm to reduce or eliminate Bacterial Cold Water Disease (BCWD). Excessive gas in the incubation influent water is variable and appears to be associated with periodic increases

in yolk coagulation in eggs and fry.

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.

Eggs will be treated to prevent fungus outbreaks and incubated using well water to prevent loss due to siltation.

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..

Survival to eye-up for 1995-1998:

Brood Year	% Survival
1995	90.6
1996	89.5
1997	90.2
1998	98

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

Densities are < .4 lbs/ft3 (650,000 fish/pond) and at release they are at a density index of ~.17.

9.2.3) Fish rearing conditions

Total gas and corresponding DO's have been extensively monitored by HARZA N.W., contractors with TPU. Due to the re-circulating nature of the Cowlitz Salmon Hatchery ponds, DO's of influent and effluent water are often nearly the same. For example, with water temperatures at 46° Fahrenheit, a pond of fish had 8.4 ppm DO influent and 9.0 ppm DO in effluent water.

Carbon dioxide has not been measured in recent years.

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.

Not available

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

Not 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*).

Although Cowlitz fall chinook have been fed dry feeds with reasonable success, they are typically started on BioDiet Starter #3 and then BioMoist Grower feed. The 1991, 1992, 1993 and 1994 broodyears had conversion rates of 1.32:1, 1.5:1, 1.3:1 and 1.36:1, respectively.

Fall chinook are typically fed between 2.5% and 3.5% B.W./day, depending upon water temperature and weather conditions. They are pushed to grow as quickly as possible despite cool spring water temperatures (partly due to reservoirs upstream). Attempts are made to keep fall chinook that are under 100 fpp. below 3 lbs/gpm flow. In recent years, fall chinook are typically planted in late May or June at approximately 60 - 80 fpp. and at 5 lbs/gpm.

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

The Cowlitz Complex has a permanent fish pathologist that routinely samples and checks for IHNV and BKD (Bacterial Kidney Disease). All equipment is sanitized after use in a iodine solution.

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

None used at this time. Although, organosomatic indexes were conducted by personnel from the WDF fish health section during late 1980s and early 1990s under BPA funding. ATPase work was conducted by Wally Zaugg, NMFS, in the early 1980s and reported in the Proceedings of the Northwest Fish Culture Conference for the fish released in the Cowlitz River.

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

None.

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

Fish will be reared to smolt size to mimic the natural fish emigration.

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	5,000,000	60	May-June	Cowlitz River (RM 49)
Yearling				

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

Stream, river, or watercourse: Cowlitz River (26.0002)
Release point: Cowlitz River (RM 49)
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	Yearling	Avg size
1988								
1989								
1990								
1991								
1992								
1993								
1994								
1995					7,294,900			
1996					6,334,100			
1997					6,921,736	80		
1998					5,945,600	71		
1999					4,002,900	66		
Average					6,099,847			

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

Note: Releases only reflect those that are released on-station. Releases into upper watershed (Riffe lake, for example) do not take place at this time.

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

Normally, Cowlitz fall chinook are released from mid May through late June, usually at 60 to 80 fpp as 0+ age fish. The 1999 release took place in May, June and July. Size ranged between 63 and 68 fpp. The 1998 group was planted in May and June averaging 71 fpp. The 97' release took place in June and July at ~ 80 fpp. Due to low water temperatures during rearing growth rates are suppressed and late ponded fish do not attain release size until June/July. All releases are forced.

10.5) Fish transportation procedures, if applicable.

Not applicable.

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

Acclimated on river water during their entire rearing time.

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

200,000 fish are adipose-fin clipped/coded-wire tagged at the present time. Mass marking has been postponed for the 2000 broodyear population. No plans for the future to mass mark at this time.

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

Prior to the 90's, all excess fry were released from the facility. Since then, all releases have followed programmed numbers in compliance to ESA.

10.9) Fish health certification procedures applied pre-release.

Fish are inspected by the on-station fish pathologist prior to release.

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

Water is stored in empty ponds for flushing in case fish need to be released due to lack of 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.

All fall chinook will be released as smolts to minimize the interaction with listed stocks. The releasing of fish late may provide this window of opportunity for natural fish. Also, hatchery fish survival may be decreased, being released late, due to the Columbia River becoming excessively warmer.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

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

See 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.

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

Provide the following information for any research programs conducted in ***direct association with the hatchery program described in this HGMP. Provide sufficient detail to allow for the independent assessment of the effects of the research program on listed fish****. If applicable, correlate with research indicated as needed in any ESU hatchery plan approved by the co-managers and NMFS. Attach a copy of any formal research proposal addressing activities covered in this section. Include estimated take levels for the research program with take levels provided for the associated hatchery program in* ***Table 1****.*

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

Include all references cited in the HGMP. In particular, indicate hatchery databases used to provide data for each section. Include electronic links to the hatchery databases used (if feasible), or to the staff person responsible for maintaining the hatchery database referenced (indicate email address). Attach or cite (where commonly available) relevant reports that describe the hatchery operation and impacts on the listed species or its critical habitat. Include any EISs, EAs, Biological Assessments, benefit/risk assessments, or other analysis or plans that provide pertinent background information to facilitate evaluation of the HGMP.

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 Two: Cowlitz Salmon Hatchery mitigation report 1997. Pp. 2-1 - 2-62.

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: Chinook ESU/Population: lower Columbia Chinook Activity: Hatchery				
Location of hatchery activity: Cowlitz R. (RM 49) Dates of activity: August-June 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.

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

Listed species affected: Steelhead ESU/Population: lower Columbia Steelhead Activity: Hatchery				
Location of hatchery activity: Cowlitz R. (RM 49) Dates of activity: August-June 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)				
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.

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

Listed species affected: Chum ESU/Population: lower Columbia Chum Activity: Hatchery				
Location of hatchery activity: Cowlitz R. (RM 49) Dates of activity: August-June 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	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.