HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	Cowlitz Game and Anglers Lower Cowlitz River Tributaries - Coho Fry Releases
Species or Hatchery Stock	Coho (*Oncorhynchus kisutch*)
Agency/Operator	Washington Department of Fish and Wildlife
Watershed and Region	Cowlitz Subbasin/Lower Columbia Province
Date Submitted	
Date Last Updated	April 15, 2004

Section 1: General Program Description

1.1 Name of hatchery or program.

Cowlitz Game and Anglers Coho Fry Program

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

Coho (*Oncorhynchus kisutch*) - Type N

ESA Status: Both wild and hatchery programs including the Upper and Lower Cowlitz programs are proposed for listing (NOAA 69 FR 33101; 6/14/2004).

1.3 Responsible organization and individuals.

Name (and title):	Mark Johnson
	Cowlitz Complex Manager
Agency or Tribe:	Washington Department of Fish & Wildlife
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program.

Co-operators	Role
Tacoma Public Utilities	Funding Source and Facility Maintenance
Cowlitz Game and Anglers	Provides staff and support

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

Funding Sources
Tacoma Public Utilities – See Cowlitz Hatchery Coho HGMP
Cowlitz Game and Anglers – Non profit organization provides in kind services

1.5 Location(s) of hatchery and associated facilities.

Broodstock source	Cowlitz Hatchery Coho Stock (Type N)
Broodstock collection location (stream, RKm, subbasin)	Cowlitz Salmon Hatchery/Cowlitz River/RKm 78.8/Cowlitz
Adult holding location (stream, RKm, subbasin)	Cowlitz Salmon Hatchery/Cowlitz River/RKm 78.8/Cowlitz
Spawning location (stream, RKm, subbasin)	Cowlitz Salmon Hatchery/Cowlitz River/RKm 78.8/Cowlitz
Incubation location (facility name, stream, RKm, subbasin)	Cowlitz Salmon Hatchery/Cowlitz River/RKm 78.8/Cowlitz Eyed eggs are transferred to Cowlitz Game and Anglers - See section 1.11.2 for RSI sites.

1.6 Type of program.

Integrated Recovery

1.7 Purpose (Goal) of program.

The goal of this program is to help mitigate for the loss of coho salmon that would have been produced naturally in the Cowlitz River system in the absence of the Cowlitz River Hydroelectric Project in the basin. The program will help supplement the lost natural production in the watershed using Remote Site Egg Incubators (RSIs) in conjunction with nutrient enhancement, educational, and habitat restoration efforts.

1.8 Justification for the program.

The Cowlitz Salmon Hatchery provides eggs for this program. NOAA considers Cowlitz coho Type – N eggs used in the RSI programs to be integrated with historical Lower Cowlitz River population (NOAA Hatchery Listings May 28, 2004). Effects to viable salmonids populations (VSP) attributes including abundance, population growth rate, diversity and spatial distribution are unknown but considered to be of low risk from the (NOAA Fisheries Hatchery Policy and Proposed Updated Listing Determinations, (NOAA 69 FR 33101; 6/14/2004).

The Washington Department of Fish and Wildlife supports the use of unfed fry programs from on site eyed egg incubation units commonly referred to as “Remote Site Incubators” (RSIs) in certain areas and under certain specific conditions. A WDFW Cooperative Fish and Wildlife Project Memorandum of Understanding Fish Production Agreement is used for monitoring Statewide cooperative programs (see also section 3.2). WDFW Region 5 staff provides technical support including siting parameters, operational support and eyed eggs to Cowlitz Game and Anglers organization to help re-establish coho populations in the Cowlitz River system. These projects are part of overall watershed restoration efforts in many of the tributaries RSI projects are located on. RSI programs are also described in Washington State Legislative code: CW 77.95.200 “Remote site incubator program” formally RCW 75.50.190 where the goal is to assist the reestablishment of wild salmon and trout populations (see HGMP section 3.2).

The Cowlitz Game and Anglers is a 501(c)-3 non-profit organization which began in 1939. It is one of the first and longest running citizen groups that organized to partner with local, state and federal governments to help the natural resources in the state (pers. comm. Edwina Herkle 2004). Landowners, sports fisherman and other interested parties have worked on the fish and wildlife

projects for benefit in the Cowlitz, South Fork Toutle and Coweeman Rivers.

FERC License Article 6. - Fisheries and Hatchery Management Plan.
Both, current and future lower and upper river production by facilities on the Cowlitz system are proposed by the Cowlitz River Fisheries and Hatchery Management Plan submitted by Tacoma Power for the Cowlitz River Hydroelectric Project. Funding for the coho RSI programs is part of this mitigation and monitoring will be needed to determine effects of the program on the reference program.

1.9 List of program "Performance Standards".

See section 1.10 below.

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

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Benefits include partnerships and education with local government and local citizens	Cowlitz Game and Anglers coordinates ongoing and future cooperative projects	Volunteer involvement is tracked yearly and total hours committed are recorded.
Augment naturally spawning populations using RSI technology.	Evaluate contribution of wild smolts and adults to the system	WDFW monitors Cedar Creek populations
RSI programs operate per Cooperative Fish and Wildlife Project Memorandum of Understanding Fish Production Agreement	Cooperator reviews and submits MOU to WDFW for each year involved in the project.	WDFW compiles MOU and manages volunteer and partnership program reporting procedures
Individual RSI programs sites are highly successful at hatching eggs and swim-up fry.	RSI programs achieve a 95% eyed egg to hatch and 90% swim-up survival rate.	Cooperator submits yearly WDFW Volunteer Fish production Project Release and Planting Record Form that includes details on success of program. WDFW reviews and recommends changes if needed.
RSIs minimize impacts and/or interactions to ESA listed fish. See also Risks below.	Individual RSI projects and numbers of eggs incubated are consistent with the WDFW FBD.	Cooperator submits yearly WDFW Volunteer Fish production Project Release and Planting Record Form that includes details on fish released, date of releases and location of projects.

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Augment naturally spawning populations using RSI technology.	Evaluate contribution of wild smolts and adults to the system	WDFW monitors Cedar Creek populations for otolith research and contribution
Minimize impacts and/or interactions to ESA listed fish	RSI projects and numbers of eggs incubated are consistent with the WDFW FBD	FBD is reviewed annually by WDFW Staff for stock, size, number, date of release and location of projects.
RSI units operate in compliance with all applicable fish health protocols.	Egg/Fish health documented. Goal is to prevent the introduction, amplification or spread of fish pathogens that might negatively affect the health of both hatchery and naturally reproducing stock.	RSI Project leads and coordinators communicate regularly with Region 5 staff. Dead eggs are removed and disposed of properly to prevent fungal incidence (*Saprolegniasis).*
Ensure RSI operations comply with state and federal water quality and quantity standards through proper environmental monitoring	MOU Section 4. The Cooperator shall also be responsible for obtaining and complying with any and all necessary permits to conduct the project(s) described in the attached Exhibit(s), which may include but are not limited to: Hydraulic Project Approvals (HPA), State Environmental Protection Act checklist (SEPA), National Pollution Discharge Elimination System (NPDES), Water Rights, local construction, grading, or filling permits, etc, with the exception of federal ESA compliance, which can only be deferred upon WDFW or the Treaty Tribes of Washington. MOU Section 4. The Cooperator shall also be responsible for obtaining and complying with any and all necessary permits to conduct the project(s) described in the attached Exhibit(s), which may include but are not limited to: Hydraulic Project Approvals (HPA), State Environmental Protection Act checklist (SEPA), National Pollution Discharge Elimination System (NPDES), Water Rights, local construction, grading, or filling permits, etc, with the exception of federal ESA compliance, which can only be deferred upon WDFW or the Treaty Tribes of Washington.	The Cooperator complies with all permits required and submits MOU to WDFW for each year involved in the project before project is approved.
Water useage and in-stream water diversion structures for RSI will not affect spawning behavior of natural populations or impact juveniles.	WDFW staff provides technical site evaluation and operational support to minimize impacts of RSI water intakes (PVC pipe intake) or screen material for floating RSIs.	The Cooperator submits yearly WDFW Volunteer Fish production Project Release and Planting Record Form that includes details success or operational concerns.

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

At the current program size, the number of broodstock collected for the Cowlitz Coho program is up to a total of 3,000 adults at a female (1,500) to male (1,500) ratio of 1:1. Up to 2% of the male component is made up of jacks (approximately 75). Out of that total, approximately 12 pairs (approximately 3,800 eggs fecundity) are used to secure 40,000 eyed eggs needed for the Cowlitz Game and Anglers program.

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

Age Class	Max. No.	Size (ffp)	Release Date	Location		
				Stream (WRIA #)	Tributary Location	Eco- province
Swim up fry	10,000	1,200 – 1,500	April	Arkansas Creek (26.0189)	Right bank tributary to the Cowlitz R. located at RKm. 25.5	Lower Columbia
Swim up fry	5,000	1,200 – 1,500	April	Unnamed Trib. (26.0128)	Left bank tributary of the Cowlitz R. located at RKm. 12.2	Lower Columbia
Swim up fry	10,000	1,200 – 1,500	April	Campbell Creek (26.0443)	Tributary of Stillwater Creek, Tributary of Olequa Creek, Right bank tributary of the Cowlitz R. located at RKm. 36.4.	Lower Columbia
Swim up fry	5,000	1,200 – 1,500	April	Coweeman River	Left Bank Tributary to the Cowlitz R. at RKm. 1.3. RSI Site is at RKm 11.2 on the Coweeman.	Lower Columbia
Swim up fry	5,000	1,200 – 1,500	April	Hill Creek (26.0423)	Left bank tributary of the Cowlitz R. located at RKm. 35.12	Lower Columbia
Swim up fry	5,000	1,200 – 1,500	April	Salmon Creek (26.0479)	Left bank tributary of the Cowlitz R. located at RKm. 48.6	Lower Columbia

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

Program performance for the incubation and operational success of these projects are based on expectations that RSI programs should exceed 90% eyed-egg to swim-up fry success. Smolt productivity or adult contribution from this program are not known because eggs are not otolith marked nor monitored at this time.

While RSIs in the Cowlitz Game and Anglers program are not otolith marked, the wild coho eggs used in RSIs in Cedar Creek system are marked which could give some idea of contribution. Cedar Creek is the major spawning tributary for the Lewis River (Lewis Subbasin Summary (NPPC), DRAFT, May 17, 2002). Recent WDFW smolt monitoring work on otolith marked RSI coho eggs in Cedar Creek, indicates RSI contributions in 2002 of a .275% (eyed egg to smolt survival) equating to 1,100 smolts (approximately 2.98% of the captured run) from

the 400,000 egg RSI program in that system This does not include potential contribution from fry or fingerlings that migrated out of the tributaries before or after the sampling period and reared to smolt stage in other areas in the N.F. or mainstem Lewis River. Contribution estimates could be based on the Cedar Creek research if the productivity of the tributaries used in this program were similar.

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

Cowlitz Game and Anglers RSI programs started in the late 1990's.

1.14 Expected duration of program.

Coho production from Cowlitz Salmon Hatchery is part of the continued operation of the Cowlitz River Hydroelectric Project, FERC Project No. 2016, operated under the new license with an effective date of July 18, 2003. The license is for a term of 35 years and expires July 18, 2038. Cooperative programs such as the Cowlitz Game and Anglers eyed egg program should be ongoing until monitoring can determine that self-sustaining population densities are achieved or the programs are re-evaluated by fisheries co-managers in Washington.

1.15 Watersheds targeted by program.

Cowlitz Subbasin/Lower Columbia Province

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

1.16.1 Brief Overview of Key Issues

Cowlitz Game and Anglers is using remote site incubators to seed habitat areas in conjunction with some habitat restoration work in some of the tributaries. This program should be continued until self-sustaining population densities are achieved, but without monitoring and evaluation, it will be difficult to determine when this is achieved. WDFW would review new proposals for RSIs and require that any additional sites or increase in numbers of eggs follow Future Brood Document (FBD) policy review submittal.

1.16.2 Potential Alternatives to the Current Program

Alternative 1: Rely on natural coho adults to eventually re-colonize the tributaries.

Alternative 2. Discontinue this program. The natural fish will utilize the habitat improvements and the population will increase over time. It is unknown if the coho returning to these tributaries are any where near carrying capacity but utilization is believed to be very low due to habitat problems in lower Cowlitz Rivers tributaries including sedimentation, temperatures, low flows, and gravel quality (COWLITZ RIVER SUBBASIN Salmon and Steelhead Production Plan, September 1, 1990). WDFW does not support this alternative due to the valuable outreach and community involvement of local citizens involved with salmon recovery efforts.

1.16.3 Potential Reforms and Investments

Reform/Investment 1: Monitoring and evaluation of the interaction, production, and the carrying capacity of listed species in these tributaries should be implemented.

Reform/Investment 2: Handling and hauling equipment is needed. Volunteers provide extensive work and equipment.

Section 2: Program Effects on ESA-Listed Salmonid Populations

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

Cooperative programs are aligned under the Cowlitz River Hatchery facilities. NOAA Fisheries consulted on the operations of all the artificial propagation activities at these facilities as part of a Columbia River basinwide hatchery biological opinion in 1999 for listings prior to 1998. On March 23, 2004, NOAA Fisheries (Consultation No. 2001/02045) issued a Biological Opinion for ESA Section 7 Cowlitz River Hydroelectric Project (FERC No. 2016).

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

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

ESA listed stock	Viability	Habitat
Spring Chinook	M	L
Cowlitz Fall Chinook	L	L
Coweeman Fall Chinook-Natural	H	M
Toutle Fall Chinook	M	L
Late Winter Steelhead	H	L
Coho- (Proposed)	Na	Na
H, M and L refer to high, medium and low ratings, low implying critical and high healthy.		

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.
Lower Columbia River Coho including hatchery and wild populations within the Lower Columbia River/Southwest Washington Evolutionary Significant Unit (ESU) were proposed as threatened under the federal Endangered Species Act in 2004 (NOAA 69 FR 33101; 6/14/2004).

Identify the ESA-listed population(s) that may be incidentally affected by the program.
Lower Columbia River fall chinook salmon are listed as "threatened" under the ESA on May 24, 1999.
Lower Columbia River spring chinook salmon listed as "threatened" under the ESA on May 24, 1999.
Lower Columbia River Steelhead listed as threatened under the ESA on March 19, 1998.

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

Describe the status of the listed natural population (s) relative to "critical" and "viable" population thresholds. Critical habitat designations for LCR chinook salmon, LCR steelhead, and CR chum salmon are no longer in effect (68 Federal Register (FR) 55900 (Sept 29, 2002). Recovery planning interim viability criteria for the Willamette/Lower Columbia domain were developed by the WLCTRT (McElhany et al. 2003). Current and future recovery goals and population targets have been established for Chinook, coho, chum and steelhead populations in the LCR ESU by the Lower Columbia Fish Recovery Board (LCFRB Basin Plans 2004).

Lower Columbia River Coho: Cowlitz Hatchery coho stock are integrated with the Upper and Lower Cowlitz historic population under NOAA's proposed listing determination (69 FR 33102;

6/14/2004). Presently, most Cowlitz River coho are of hatchery origin. Mayfield Dam has blocked tributaries above river mile (RM) 52 since 1968 but natural production still occurs in several small tributaries of the lower Cowlitz including Olequa, Lacamas, Ostrander, Blue, Otter, Brights, Mill, Arkansas, Foster, and Hill creeks. Adults are also released each year to spawn in the Tilton and upper Cowlitz rivers. Natural coho production is presumed to be very low in the lower Cowlitz basin with Olequa Creek the most productive with escapement surveys on Olequa Creek from 1952-1990 established a range of 0-40 fish/mile. In 1985, an estimated 5,229 coho naturally spawned in lower Cowlitz River tributaries (excluding the Coweeman and Toutle systems), but the majority of spawners were fish originating from the Cowlitz Hatchery (LCFRB Subbasin Plans 2004, Volume II, Chapter 8 Cowlitz Subbasin—Lower Cowlitz)

Lower Columbia River spring chinook salmon (*Oncorhynchus tshawytscha*): Cowlitz Hatchery Spring Chinook are integrated with the Upper Historic population under NOAA's proposed listing determination (69 FR 33102; 6/14/2004). The current spring Chinook hatchery stock is listed as a core genetic legacy population in the Cowliutz system **(Myers et al. 2002), and core/legacy status (McElhany et al. 2003).** Natural escapement levels (which include hatchery-origin fish) are typically only 200 to 400 fish (**SaSI** 2002), although escapement in 2003 appeared to have increased significantly. Historically, spring chinook were abundant in the Cowlitz River upstream from the Mayfield Dam site. Ninety-six percent of the spring chinook production in the Cowlitz River was estimated to have occurred above Mayfield Dam from 1950 to 1961 (Easterbrooks 1980). Spring chinook were planted above the Cowlitz Falls Dam in 1995. From 1996 to the present, WDFW began collecting juveniles at Cowlitz Falls Fish Collection Facility and trucked them below Barrier Dam (John Serl 2000, personal comm.). Tacoma Power, under WDFW direction, continues to truck adults above the Cowlitz Falls Dam as part of the anadromous reintroduction program.

Lower Columbia River fall chinook salmon *(Oncorhynchus tshawytsch*a): Cowlitz River Fall chinook are indigenous and historically were abundant in the Cowlitz Basin (WDW 1990). In 1951, the fall chinook escapement to the Cowlitz River and tributaries was estimated at 31,000, with the following distributions: 10,900 to the mainstem Cowlitz and its minor tributaries, 8,100 to the Cispus, 500 to the Tilton, 6,500 to the Toutle, and 5,000 to the Coweeman (WDF 1951). Forty-six percent of the fall chinook run in the Cowlitz River was estimated to have come from above Mayfield Dam in 1950 to 1961, and 28 percent of the spawning grounds were inundated by Mayfield and Mossyrock reservoirs (Easterbrooks 1980). All fish were passed over the dams from 1962 to 1966. From 1967 to 1980, only small numbers of fall chinook were hauled to the Tilton River and upper Cowlitz. A comparison of observed and estimated adult wild fall chinook returning to the Cowlitz River from about 1820 to the present shows that production, once estimated at 100,000 adults, declined to ~18,000 in the 1950s, ~12,000 in the 1960s and recently has declined to less than 2,000 (Mobrand Biometrics, 1999). Natural spawning escapements from 1967-1991 averaged 6,778 (WDF et. al. 1993), but they have since declined to about 2,600 fish per year (Tipping 2000, personal comm.). Most of the spawning takes place between the Kelso Bridge and the Cowlitz Salmon Hatchery (WDF et. al. 1993). In 1987, DeVore estimated that naturally spawning fish comprise just over ten percent of adult returns.

Coweeman River: Historically, Coweeman River fall chinook spawned from Mulholland Creek (RM 18.4) downstream approximately 6 miles to the Jeep Club Bridge (WDF et. al. 1993). The estimated annual escapement of fall chinook in 1951 was 5,000, although splash dams probably impacted production (WDW 1990). The Coweeman River has received fall chinook plants from at least 1951 until 1979 (WDW 1990). SaSI (WDF et. al. 1993) listed fall chinook stocks as healthy in 1993; status today is depressed (SaSI 2002). For 2002 and 2003, escapement was up due to favorable river and ocean conditions (Table 3). Although derived from a mixed stock composition this population appears to be representative of the indigenous fall chinook

populations in the Cowlitz watershed as only one coded wire tagged hatchery stray has ever been recovered in spawning surveys (Hymer, personal comm., 2001).

Toutle River Fall Chinook. Natural spawners of both hatchery and natural origin in the Toutle subbasin averaged 6,573 fish from 1964 through 1979 with the following distribution: 4.8 percent from the mainstem, 3.8 percent South Fork Toutle, 49.4 percent North Fork Toutle, and 42 percent Green River (Kreitman 1981 as cited in WDW 1990). Natural spawners (hatchery and natural origin) from 1964 through 1979 averaged 42 percent (equal to 4,517 fish) of the Toutle subbasin spawners, which were estimated at 10,756 fish (Kreitman 1981 as cited in WDW 1990). From 1990–2001, escapement in the South Fork Toutle system averaged 57 fish although significant increases in fall Chinook escapement for 2002 and 2003 reflect the Lower Columbia River trend for those past 2 years.

Lower Columbia River Steelhead *(Oncorhynchus mykiss*): In Washington, the LCR steelhead ESU includes winter and summer steelhead in tributaries to the Columbia River between the Cowlitz River and Wind River. The Cowlitz system had six historical populations including three core (Cispus, Upper Cowlitz and N.F. Toutle) populations. All are winter steelhead stocks with the Cispus winter run population hatchery stock is listed as a core genetic legacy population **(Myers et al. 2002), and core/legacy status (McElhany et al. 2003).**

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

Hatchery activities are identified in the ESA Section 7 Consultation "Biological Opinion on Artificial Propagation in the Columbia River Basin" (March 29, 1999). All activities accept for take of listed broodstock cannot be quantified.

1) Broodstock Collection: Broodstock for RSI programs are collected at Cowlitz Salmon Hatchery (see Cowlitz Coho HGMPs also). Eggs for the Cowlitz Game and Anglers RSI programs are identified as one of the programs included in the proposed listing for the Lower Columbia ESU (NOAA 69 FR 33101; 6/14/2004). Take for proposed listed coho are located at the end of the HGMP.

2) Operation of Hatchery Facilities: All RSI units are temporally sited bucket incubators which are situated on firm ground adjacent to the stream. The site is chosen to provide protection from high instream flows and provide a secure water flow via a gravity fed PVC pipeline. An outlet overflow pipe leads from the RSI unit back to the stream and allows volitional release of swim up fry. RSIs are used for approximately 2-3 months, then dismantled and removed from the area after fry have vacated the unit. A Cooperative Fish and Wildlife Project Memorandum of Understanding Fish Production Agreement for the Fish First RSI projects are used as a condition of operation with cooperative programs for impacts except ESA compliance. The water intakes are screened to keep debris or listed fish from entering the unit. Indirect take on any listed fish is unknown.

3) Genetic introgression: There would be no genetic introgression concerns as the program is using the local Cowlitz coho stock for upper and lower river recovery.

4) Hatchery Production/Density-Dependent Effects: RSI units can hatch and produce up to 95% swimup fry from the units compared to wild spawning and swimup rates of 5-20% depending on habitat. By applying smolt contribution such as seen on Cedar Creek research, individual RSIs could contribute smolts to individual tributaries (.275% eyed egg to smolt contribution). It is unknown what impacts would be on the present total smolt production in the lower Cowlitz River system estimated at 123,123 smolts for the lower Cowlitz River, (EDT LCFRB Basin Plans 2004)

5) Disease: Eyed eggs have been incubated at Cowlitz Salmon Hatchery under IHOT Fish Health guidelines. Eyed eggs have been shocked and picked before being transferred to the RSI sites. Fish First staff regularly remove dead eggs from the RSI units to prevent fungal spread (*Saprolegniasis)* from dead eggs to healthy eggs.

6) Competition: RSI incubation techniques can have egg-to-fry survival rates of well over 95%, a significant increase over values reported for naturally incubated eggs. Releasing un-fed fry into reduced rearing habitat (due to reduced summer flows, etc) could increase competition for food and habitat. RSI programs have been sited in areas that need re-seeding and where wild fry competition would be minimal.

7) Predation: Coho egress from the RSI at approximately 1,500 fpp (30-35 mm fl) starting in March-April. Coho fry from the RSI program pose no known predatory risk to listed salmonids during the first year of rearing. If they survive to a yearling stage, they could pose an unknown predatory risk to listed fish <40mm fl. In Cedar Creek, smolt trapping data (March-Jun, 2003) indicated the average size of wild coho smolt emigrating past the trap to be 121 mm fl (90-198 mm fl). Research on RSI produced coho in Snow and Andrews Creeks on the Olympic Peninsula (WDOT, 2002) indicated that coho ranged from 36-40 mm fl in April to 40-55mm fl in May to 60 mm fl in June. Smolted coho captured during this study (May) ranged from 80-105mm fl.

8) Dates of Releases: Coho fry egress from the RSI's beginning in late March and could continue through April. By the end of April, RSIs are empty and the structures are removed for the year.

9) Residualism: It is unknown if residualism occurs with these programs since they are only hatched out and then egress as unfed fry.

10) Migration Corridor/Ocean: It is unknown due to the small number of eggs and fish involved with this program if there is any impact in the migration corridor or ocean.

Associated Monitoring Activities – Wild stock productivity research monitoring and evaluation is ongoing for Cedar Creek. The following monitoring activities are also conducted in the Lower Columbia Management Area (LCMA) for adult steelhead and salmon. Included are redd surveys conducted for winter steelhead in the SF Toutle, Coweeman, EF Lewis and Washougal rivers. Redd surveys are also conducted in the Cowlitz River for fall and spring chinook. Mark-recapture carcass surveys are conducted to estimate populations of chinook salmon in Grays, Elochoman, Coweeman, SF Toutle, Green, Kalama, NF Lewis, EF Lewis rivers and Skamokawa, Mill, Abernathy, and Germany creeks and for all chum salmon populations. Snorkel surveys are conducted for summer steelhead in the EF Lewis and Washougal rivers. Trap counts are conducted on the Cowlitz, NF Toutle, Kalama, and Wind rivers and on Cedar Creek, a tributary of the NF Lewis River. All sampling of carcasses and trapped fish include recovery of coded wide tagged (CWT) fish for hatchery and wild stock evaluation. Any take associated with monitoring activities is unknown but all follow scientific protocols designed to minimize impact.

Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish. Refer to take tables in the Cowlitz Coho HGMP.

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). Refer to take tables in the Cowlitz Coho 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 levels will not exceed levels described in the Cowlitz Coho program. The amount of adults taken for this program is set through the FBD process.

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.

Cooperative programs would be aligned with goals and objectives in the Cowlitz River system. The production developed for from Cowlitz Salmon Hatchery will be integrated with *U.S. v Oregon* and the Columbia River Fish Management Plan (CRFMP) and with hatchery plans documented in WDFW's yearly Future Brood Document (FBD), and Lower Columbia Fisheries Management and Evaluation Plan (2002 FMEP) which has been agreed to by NOAA for listed steelhead, chum, and Chinook in the ESU.

For ESU-wide hatchery plans, the coho production from Cowlitz Salmon Hatchery was described in the 1999 Biological Opinion on Artificial Propagation in the Columbia River Basin and the 1999 Review of Artificial Production of Anadromous and Resident Fish in the Columbia River Basin. Both cooperative and educational value projects are described with the hatchery production. Current production numbers can vary from past productivity levels and reflect reductions in programs due to ESA concerns.

Hatchery programs in the Columbia system adhere to a number of guidelines, policies and permit requirements in order to operate. These constraints are designed to limit adverse effects on cultured fish, wild fish and the environment that might result from hatchery practices. The following is a list of guidelines, policies and permit requirements that guide WDFW Columbia hatchery operations:

- *Genetic Manual and Guidelines for Pacific Salmon Hatcheries in Washington*.
- *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).
- *Spawning Guidelines for Washington Department of Fisheries Hatcheries*.
- *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 7, IHOT 1995).
- *Stock Transfer Guidelines*.
- *Fish Health Policy in the Columbia Basin*.
- *National Pollutant Discharge Elimination System Permit Requirements*

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

Cooperative Fish and Wildlife Project Memorandum of Understanding (MOU) Fish Production Agreement:

A Cooperative Fish and Wildlife Project Memorandum of Understanding Fish Production Agreement is used to monitor volunteer cooperative programs. Amoung the important operational concerns, the Cooperator is be responsible for: a) obtaining permission to work on private property; b) maintaining a list of volunteer workers and their hours of work; and c) submitting completed annual planting slips to the Department within 30 days of release. The Cooperator shall also be responsible for obtaining and complying with any and all necessary permits to conduct the project(s) described in the attached Exhibit(s), which may include but are not limited to: Hydraulic Project Approvals (HPA), State Environmental Protection Act checklist (SEPA), National Pollution Discharge Elimination System (NPDES), Water Rights, local construction, grading, or filling permits, etc, with the exception of federal ESA compliance, which can only be deferred upon WDFW or the Treaty Tribes of Washington.

RSI Programs in Legislative code:
RSI programs described are in Legislative code: CW 77.95.200 "Remote site incubator program" formally RCW 75.50.190. The legislature finds that trout and salmon populations are depleted in many state waters. Restoration of these populations to a healthy status requires improved protection of these species and their habitats. However, in some instances restoration of self-sustaining populations also requires the reintroduction of the fish into their native habitat. Remote site incubators have been shown to be a cost-effective means of bypassing the early period of high mortality experienced by salmonid eggs that are naturally spawned in streams. In addition, remote site incubators provide an efficient method for reintroduction of fish into areas that are not seeded by natural spawning. The technology for remote site incubators is well developed, and their application is easily accomplished in a wide variety of habitat by persons with a moderate level of training. It is a goal of the remote site incubator program to assist the reestablishment of wild salmon and trout populations that are self-sustaining through natural spawning.

3.3 Relationship to harvest objectives.

Fish are not marked in any way to contribute to harvest objectives. Any adults produced from the RSI programs would be protected by harvest rules on wild coho. There is no sport salmon harvest in tributary creeks.

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

Not applicable.

3.4 Relationship to habitat protection and recovery strategies.

Local citizens participate with Tacoma City Light (FERC 2016), Lewis River PUD (FERC 2833), federal and local government agencies, along with both technical and policy WDFW personnel on a number of habitat protection and recovery strategies in the Cowlitz basin. Key areas of habitat protection and restoration priorities are identified along with strategies to help recover salmonid populations in lower river tributaries or the Upper Cowlitz system. Upper Cowlitz River reintroduction and nutrient enhancement programs have used returns to the Cowlitz Hatcheries as key components in the recovery strategies.

The following processes have been key for habitat protection and evolved as key components to The Lower Columbia Salmon Recovery and Fish and Wildlife Sub-basin Plans (Volume 1; Clark, Cowlitz, Lewis, Skamania and Wahkiakum Counties, December 15, 2004) and along with long term re-licensing agreements with Tacoma City Light:

Sub-Basin Planning
Recent regional sub-basin planning processes include the Cowlitz River Sub-basin Salmon and Steelhead Production Plan, September 1, 1990. A more recent Draft Cowlitz River Subbasin Summary (May 17, 2002) was prepared for the Northwest Power Planning Council. The Sub-basin efforts provided initial building blocks for the regional recovery plan. *The Lower Columbia fish Recovery Board (LCFRB)* has adopted The Lower Columbia Salmon Recovery and Fish and Wildlife Sub-basin Plans (Volume 1; Clark, Cowlitz, Lewis, Skamania and Wahkiakum Counties, December 15, 2004) with the understanding that Implementation of the schedule and actions for local jurisdictions depends upon funding and other resources.

Cowlitz River Hydroelectric Project Re-licensing Settlement Agreement (FERC 2016). A number of Articles dealing with habitat issues have been included in the Settlement: The Fish Habitat fund (Article 11) in the amount of $3.0 million before January 18, 2004, the date required by the License. Upon license issuance, Tacoma Power implemented the in-stream flows

as prescribed by this article – In-stream flows (Article 13). Ramping Rate Conditions - Tacoma Power has implemented the ramping rates as prescribed by Article 14. The Cowlitz River Fisheries and Hatchery Management Plan (FHMP) Final of August 2004 was Prepared by Tacoma Power to fulfill Article 6 of the Settlement detailing the short range and long range goals of reintroduction and recovery of upper basin indigenous stocks along with hatchery production goals and operations below the barrier dam. The FHMP was built using the concepts and modeling tools inherent in the Ecosystem Diagnosis and Treatment (EDT) methodology and the hatchery production guidelines developed through the Northwest Power Planning Council Artificial Production Review and Evaluation (APRE) process. The APRE process was initiated in response to a Congressional directive to the Northwest Power Planning Council. Building upon the principles and criteria provided by the Hatchery Science Review Group (HSRG) in the *Scientific Framework for Artificial Propagation of Salmon and Steelhead* (HSRG 2002), the APRE identifies hatchery operating procedures that maximize the benefits of artificial production programs while minimizing the risks to natural populations.

Lewis County Public Utility District's (PUD) Cowlitz Falls project (FERC No. 2833)
Although not part of this Project, Lewis County Public Utility District's (PUD) Cowlitz Falls project (FERC No. 2833), constructed in 1994, is the uppermost dam on the mainstem Cowlitz River. It is located just upstream from the headwaters of Riffe Lake and forms the 11-mile-long Lake Scanewa. The mainstem Cowlitz River flows unimpeded above Lake Scannewa (the lake formed by the Cowlitz Falls project) and below Mayfield Dam.

3.5 Ecological interactions.

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

(1) *Salmonid and non-salmonid fishes or species that could negatively impact the program*: In Lower Cowlitz tributary streams, resident trout or salmonids species including steelhead can prey upon coho fry and fingerlings. If fry survive to yearling smolt stage, they will migrate out of the system to the Columbia River. Northern pikeminnows and introduced spiny rays along the Columbia mainstem sloughs can predate on smolts as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons. Based on PIT tags recovered at a large Caspian Tern nesting colony on Rice Island, a dredge material disposal island in the Columbia river estuary, 6-25 million of the estimated 100 million out-migrating juvenile salmonids from the Columbia reaching the estuary were consumed by the terns in 1997 (Roby, et al. 1998). River otters (*Lutra canadensis*) are present in the lower Columbia region and may represent a substantial predation source on juvenile salmonids. Harbor seals (*Phoca vitulina*), Steller sea lions (*Eumetopias jubatus*), and California sea lions (*Zalophus californianus*) are commonly observed in the Columbia River estuary. Seals and sea lions reportedly prey on adult salmonids, although diet studies indicate that other fish species generally comprise the majority of their food. These mammals are often attracted to concentrated fishing effort and can be troublesome to both sport and commercial fishers by taking hooked or net-caught fish before they can be landed. Additionally, other hatchery fish may be a source of competition for Cowlitz coho smolts.

(2) Salmonid and non-salmonid fishes or species that could be negatively impacted by the program:
Co-occurring natural salmon and steelhead populations in local tributary areas and the Columbia River mainstem corridor areas could be negatively impacted by program fish. Of primary concern are the ESA listed endangered and threatened salmonids: Snake River fall-run chinook salmon ESU (threatened); Snake River spring/summer-run chinook salmon ESU (threatened); Lower Columbia River chinook salmon ESU (threatened); Upper Columbia River spring-run chinook salmon ESU

(endangered); Columbia River chum salmon ESU (threatened); Snake River sockeye salmon ESU (endangered); Upper Columbia River steelhead ESU (endangered); Snake River Basin steelhead ESU (threatened); Lower Columbia River steelhead ESU (threatened); Middle Columbia River steelhead ESU (threatened); and the Columbia River distinct population segment of bull trout (threatened). The potential exists for large-scale hatchery releases of fry and fingerling ocean-type chinook salmon to overwhelm the production capacity of estuaries (Lichatowich and McIntyre 1987). Estuaries may be "overgrazed" when large numbers of ocean-type juveniles enter the estuary en masse (Reimers 1973, Healey 1991). Listed fish can be impacted through a complex web of short and long term processes and over multiple time periods which makes evaluation of this a net effect difficult. WDFW is unaware of studies directly evaluating adverse ecological effects to listed salmon. See also Section 2.2.3 Predation and Competition.

3) Salmonid and non-salmonid fishes or other species that could positively impact the program.
Returning coho and other salmonid species that naturally spawn in the target stream and surrounding production areas may positively impact program fish. Decaying carcasses may contribute nutrients that increase productivity of the overall system. There are no species that are known to directly positively impact the program. Multiple hatchery programs salmonids releases into the Columbia river system along with listed species (section 2), benefit the program by providing additional predation opportunity in the Columbia mainstem and estuary. Numerous non-salmonid fishes sculpins, lampreys and sucker etc. also would provide the same indirect benefits.

4) Salmonid and non-salmonid fishes or species that could be positively impacted by the program. A host of freshwater and marine species that depend on salmonids as a nutrient and food base may be positively impacted by program fish. The hatchery program may be filling an ecological niche in the freshwater and marine ecosystem. A large number of species are known to utilize juvenile and adult salmon as a nutrient and food base (Groot and Margolis 1991; and McNeil and Himsworth 1980). Wild co-occurring salmonid populations might be benefited as hatchery fish migrate through an area. The migrating hatchery fish may overwhelm predator populations, providing a protective effect to the co-occurring wild populations. Pacific salmon carcasses are also important for nutrient input back to freshwater streams (Cederholm et al. 1999). Successful or non-successfully spawner adults originating from this program may provide a source of nutrients in oligotrohic coastal river systems and stimulate stream productivity. Carcasses from returning adult salmonids have been found to elevate stream productivity through several pathways, including: 1) the releases of nutrients from decaying carcasses has been observed to stimulate primary productivity (Wipfli et al. 1998); 2) the decaying carcasses have been found to enrich the food base of aquatic invertebrates (Mathisen et al. 1988); and 3) juvenile salmonids have been observed to feed directly on the carcasses (Bilby et al. 1996). Nutrient Enhancement and biomass Needs for the upper Cowlitz system are discussed in section 3.6.1(FHMP).

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.

Prior to transfer to the RSI sites, eggs have been eyed at the Cowlitz Salmon Hatchery where water temperatures range from 46-61 degrees Fahrenheit. RSI programs operate in the streams from January to April. Individual tributary water flow data is not known, but by mid-winter most creek instream flows have been recharged thoughout the system. Friends of the Cowlitz First RSI sites have been located in areas where conditions for short term incubation would be successful.

From December to April water temperatures in many of the creeks can system range from 5-8 degrees Celsius (41 – 46.5 degrees F). In order to grow to a yearling smolt phase, fry will disperse and need to rear in the system until the following year. Both instream flow and elevated water temperatures during the summer months are limiting factors for many lower Cowlitz River tribuatires (LFA 26 2002). Water temperatures often exceeding 16 degrees C during July and August, and sometimes reach near lethal temperatures for salmonids (23-25 degrees C). NOAA has indicated that when waters temperatures are elevated above 15 to 17.8 degrees Celsius, they are rated as poor for salmon. Reeves et al. (1989) indicated that when minimum water temperatures exceed 20 degrees C for two weeks or more, summer coho salmon parr production is detrimental. Water quality, especially high water temperatures, was identified as a major limiting factor within certain subbasins of WRIA 26. Water quantity was also identified as a limiting factor almost throughout WRIA 26.

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.

- RSI sites have been chosen that provide a consistent source of water with minimal siltation problems.
- Water intake pipes are screened to prevent debris or fish from entering the incubator.
- Loadings into the bucket RSI's are less than 50% of capacity therefore reducing risk of dead eggs potentially spreading fungal problems to adjacent healthy eggs.
- Dead eggs or hatched fry can be removed and are disposed to prevent transmission through the discharge pipe.
- RSIs are checked regularly or more if needed due to significant rain events.

Section 5. Facilities

5.1 Broodstock collection facilities (or methods).

See Cowlitz River Type N coho HGMP.

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

Eggs are incubated to eyed stage at Cowlitz Salmon Hatchery. By early February or depending on water temperatures of egg take dates of late coho, eggs have developed to eyed stage where Cowlitz Game and Anglers staff will arrange to pick up egg allotments and transport eyed eggs in wet burlap sacks by car or truck to the multiple RSI sites.

5.3 Broodstock holding and spawning facilities.

See Cowlitz River Type N coho HGMP

5.4 Incubation facilities.

Eggs are incubated at Cowlitz Salmon Hatchery in vertical stack incubators to an eyed egg stage and then transferred.

Cowlitz Game and Anglers has used modified 5 gallon buckets for most of the program although older vertical incubators (Heath Techna) at Cowlitz Salmon Hatchery are being replaced by newer units and are being used and incorporated into the RSI program. Stacks of incubator trays will be plumbed with PVS piping to provide 5 gpm through the trays and accommodate up to 8,000 eggs each if needed but loadings will be reduced per tray and allow more space. Stack incubators have a screened top and would not allow volitional release. Each 5 gallon bucket could safely accommodate up to 5,000 eggs. Water flows into the bucket through a flow diffuser about one inch from the bottom, and flows out of the bucket a few inches from the top, creating an upwelling of water through artificial incubation substrate. Eggs are suspended on trays above the substrate. The bucket can be drained to clean sediment out without disturbing the eggs. Eyed eggs hatch and disperse within the artificial substrate which provides an appropriate environment for incubating sac fry. Upon yolk absorption, fry move up through the substrate and exit through the outlet pipe volitionally.

5.5 Rearing facilities.

Eyed eggs rear within the 5 gallon bucket incubators from eyed egg stage to hatch and swim-up stage and are then allowed to leave the units as unfed fry. Upon transitioning to stack incubators, releases would by manual.

5.6 Acclimation/release facilities.

RSIs are used only to swim-up fry stage. Subsequently, fry need to rear to a yearling stage in the tributary or Cowlitz River mainstem.

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

Flow disruption to the RSI can cause significant mortalities but few problems of this type have been reported by the operators (Friends of the Cowlitz).

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.

- Program uses multiple locations in the same system
- RSI sites have been chosen that provide a consistent source of water with minimal siltation problems.
- Water intake pipes are screened to prevent debris or fish from entering the incubator.
- Loadings into the RSI's are less than 50% of capacity therefore reducing risk of dead eggs potentially spreading fungal problems to adjacent healthy eggs.
- Dead eggs or hatched fry can be removed and are disposed to prevent transmission of diseases.
- RSIs are checked regularly or more if needed due to significant rain events.

Section 6. Broodstock Origin and Identity

6.1 Source.

Coho identified as hatchery coho returning to the Cowlitz Salmon Hatchery.

6.2.1 History.

Broodstock Source	Origin	Year(s) Used	
		Begin	End
Cowlitz River Type N Coho	H	1970	Present

Coho were historically abundant in the subbasin; the Washington Department of Fisheries (1951) estimated that coho escapement was about 32,500 fish. In the Cowlitz River, an average of 24,579 coho were counted past Mayfield Dam in 1961 through 1966 (Thompson and Rothfus 1969). were observed, Two spawning peaks fish. which were classified as early-run and late-run. Currently, the coho type is considered an N-Type stock. This is more a management designation of harvest contribution areas north of the Columbia River. Broodstock are collected from adults retuning throughout September through January. Distribution was throughout the watershed, although the Department of Fisheries (1951) felt the Coweeman was underescaped due to the presence of splash dams blocking areas of production. Recently, distribution has been primarily confined below Mayfield, although some coho have been trucked above Mayfield into the Tilton and upper Cowlitz rivers in most years. The Cowlitz Salmon Hatchery was completed in 1967 to maintain the coho run at a mitigation level of 25,500 adults to the hatchery rack.

6.2.2 Annual size.

Approximately 55 females are used for this program. Egg fecundity is approximately 3,800 (Cowlitz SH Annual Reports 2002).

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

Past levels of natural fish in broodstock is unknown. Hatchery coho have been planted in the Cowlitz since at least 1915, as releases from the Tilton River Hatchery which operated downstream of Morton until 1921. Stock mixing probably began in 1915 (DeVore 1987). The level of natural fish in the broodstock will not be determined until the integrated program starts depending on the level of upriver production.

6.2.4 Genetic or ecological differences.

Historically, 2 separate runs of coho salmon were reported to enter the Cowlitz River. The early run (Type-S) entered the Cowlitz from late August and September, with a spawning peak in late October. The late run (Type-N) entered the Cowlitz from October through March, with a spawning peak in late November (WDF and WFC 1948 as cited in Dammers et al. 2002). Most coho in the Cowlitz River basin are of hatchery origin. DeVore (1987) examined the 1982-brood hatchery release and concluded wild/natural production was minor. Coho destined for areas above the Mayfield Dam provided the broodstock for this program. The broodstock is a combination of all populations that occurred above the dam including an early timed run and a later run timed coho. Minimal coho releases from outside the basin have occurred.

6.2.5 Reasons for choosing.

Hatchery coho salmon were derived from the local population and are representative of the natural origin population. Cowlitz River coho are managed for a large range of return timing; but the later Type-N stock returns after the fall chinook season, so their harvest in the Columbia River gill-net fishery was not affected by chinook conservation efforts. The Type-N stock has dominated Cowlitz Hatchery production because catch distribution favors the Washington ocean fishery rather than the fisheries south of the Columbia River (WDW 1990).

6.3 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

Broodstock are selected over a wide range of coho escapement back to the hatchery to best represent the historical timing of the run. Eggs are taken from three time periods with the first group made up of adults arriving during the period of September 23, 2002 through October 17, 2002 (45% of yearling released). The middle group is made up of adults arriving during the period of October 18, 2002 through November 21, 2002 (45% of yearling released). The late group returned to the hatchery from November 22, 2002 through January 25, 2003. Progeny from “late” arriving adults have historically been only 10% of the yearling release.

Section 7. Broodstock Collection

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

Adults at Cowlitz Salmon Hatchery.

7.2 Collection or sampling design

See Cowlitz River Type N coho HGMP

7.3 Identity.

All coho released from the Cowlitz Salmon Hatchery are currently mass marked. All fish are hand sorted at the Cowlitz Salmon Hatchery and only hatchery identified fish of the appropriate time and number are retained for spawning use. All wild coho are transported to the upper basin.

7.4 Proposed number to be collected:

7.4.1 Program goal (assuming 1:1 sex ratio for adults):
See Cowlitz River Type N coho HGMP.

7.4.2 Broodstock collection levels for the last twelve years (e.g. 1990-2001), or for most recent years available.

See Cowlitz River Type N coho HGMP.

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

See Cowlitz River Type N coho HGMP

7.6 Fish transportation and holding methods.

See Cowlitz River Type N coho HGMP

7.7 Describe fish health maintenance and sanitation procedures applied.

See Cowlitz River Type N coho HGMP

7.8 Disposition of carcasses.

See Cowlitz River Type N coho HGMP

7.9 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

See Cowlitz River Type N coho HGMP

Section 8. Mating

8.1 Selection method.

See Cowlitz River Type N coho HGMP

8.2 Males.

See Cowlitz River Type N coho HGMP

8.3 Fertilization.

See Cowlitz River Type N coho HGMP

8.4 Cryopreserved gametes.

Cryopreserved gametes are not used.

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

See Cowlitz River Type N coho HGMP

Section 9. Incubation and Rearing.

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

Cowlitz Salmon Hatchery egg take goal for 2005 is 4,266,000. Approximately 208,00 eggs are taken for the portion needed for the RSI program. Cowlitz Game and Anglers reports high survival rates of 98% or better from picked loss through the eyed eggs stage and from post release monitoring of loss within the RSI.

9.1.2 Cause for, and disposition of surplus egg takes.

See Cowlitz River Type N coho HGMP

9.1.3 Loading densities applied during incubation.

Stacks of incubator trays will be plumbed with PVS piping to provide 5 gpm through the trays and accommodate up to 8,000 eggs each if needed but loadings will be reduced per tray and allow more space. Each 5 gallon bucket could safely accommodate up to 5,000 eggs.

9.1.4 Incubation conditions.

Cowlitz Game and Anglers has used modified 5 gallon buckets for most of the program although older vertical incubators (Heath Techna) at Cowlitz Salmon Hatchery are being replaced by newer units and are being used and incorporated into the RSI program. Stacks of incubator trays will be plumbed with PVS piping to provide 5 gpm through the trays and accommodate up to 8,000 eggs each if needed but loadings will be reduced per tray and allow more space. Each 5 gallon bucket could safely accommodate up to 5,000 eggs. Water flows into the bucket through a flow diffuser about one inch from the bottom, and flows out of the bucket a few inches from the top, creating an upwelling of water through artificial incubation substrate. Eggs are suspended on trays above the substrate. The bucket can be drained to clean sediment out without disturbing the eggs. Eyed eggs hatch and disperse within the artificial substrate which provides an appropriate environment for incubating sac fry. Upon yolk absorption, fry move up through the substrate and exit through the outlet pipe volitionally. After eyeing and picking of the eggs, vexar, a plastic substrate, is placed into the tray to promote resting. This promotes healthier, larger and more uniform fry development. Incoming water is believed to be fully saturated with oxygen and is the ambient temperature of the tributary stream.

9.1.5 Ponding.

Eggs in the 5 gallon buckets are incubated in a manner that allows volitional emigration of fry. When fry were at swim up stage they can egress the RSI unit via an outlet pipe back to the stream. For the Heath – Techna stack incubators, fry would be confined in trays that are screened and would have to be manually released to stream.

9.1.6 Fish health maintenance and monitoring.

Prior to transfer to the RSI sites, disinfection procedures are implemented during incubation at Cowlitz Salmon Hatchery that prevent pathogen transmission between stocks of fish on site. Following eye-up stage, eggs are inventoried and dead or undeveloped eggs are removed to prevent fungal infection of healthy eggs. They are disposed of in a manner that prevents disease transmission to the receiving watershed.

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.

- From 220 – 500 temperature units, eyed eggs are resistance to shock during transportation, handling and loading of the eggs into the incubators.
- Eyed eggs can survive loss of water for extended periods of time and if due to silt or high water problems can be drained of water and kept moist until water conditions allow continued operations.
- Eggs and alevins are protected from predators until the free swimming stage.
- An additional tray can be used to minimize silt or sediment problems.
- Egg loss is monitored and dead eggs are removed to prevent fungal spread from one egg to another.
- Monitoring indicates that survival rates from eyed egg to fry is often better than 90% as compared to natural spawning survival rates of between 5% and 20%.

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

Since program inception, average success of incubating eyed eggs to swim-up fry in the RSI units is approximately 95% for the program (pers.Comm. Ron Glasor 2004). See also section 1.12 for wild coho RSI smolt contribution potential.

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

Stacks of incubator trays will be plumbed with PVS piping to provide 5 gpm through the trays and accommodate up to 8,000 eggs each if needed but loadings will be reduced per tray and allow more space. Each 5 gallon bucket could safely accommodate up to 5,000 eggs.

9.2.3 Fish rearing conditions.

Fish rear in the RSIs only to the extent of absorbing the yolk sac from alevin stage to a free swimming stage. Egg swill hatch from 400 – 500 temperature units (TU - daily degree unit above 32 degrees F) and will take another 300 – 400 TU to free swim and egress from the RSI. At approximately 40-45 degrees F, the typical late winter stream temperatures in the Lewis river system, hatching will take 40-50 days and within another 30-40 days fry will be free swimming. Friends of the Cowlitz volunteers monitor flow and debris which can block flow through the water intakes.

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.

By the time coho develop to free swimming fry, they are about 38-39 mm fl in length and weigh about 0.4 grams (900 – 1200 fish/lb). Subsequent growth to yearling smolt stage depends on water temperature and food availability.

Research from RSI projects on Snow and Andrews Creek located on the Olympic Penninsula indicate that coho fingerlings lengths reach 50 mm fl by mid-May and 60 mm fl by mid-June. Growth rates on RSI coho in the Lewis River system is dependent on water temperature and productivity specific to individual tributaries. Larger coho trapped from mid-April to early May indicate larger coho to be 85 – 105 mm fl.

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

Not applicable.

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*).

Not applicable.

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

Eggs are transferred within the Cowlitz River system and fall within fish and egg transfer policies. Eyed egg prior to transfer are picked of egg mortality. Subsequent egg or alevin mortality is disposed of to prevent transmission to the stream. After the program has concluded for the year, the RSI is removed, cleaned, disinfected and dried.

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

Not applicable. Coho fry will rear within stream for a year before smolt stage as yearlings.

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

Not applicable. Coho fry will rear within stream for a year before smolt stage as yearlings.

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.

- From 220 – 500 temperature units, eyed eggs are resistance to shock during transportation, weighing down and loading of the eggs into the incubators.
- Water temperatures from Cowlitz Salmon Hatchery and receiving RSIs are monitored for any significant differences and eggs can be buffered for adjusting if higher or lower if needed.
- Eyed eggs can survive loss of water for extended periods of time. If loss is due to silt or high water problems the RSI can be drained of water and the eggs can be kept moist until water conditions allow continued operation.
- Eggs and alevins are protected from predators until the free swimming stage.
- An additional tray can be used to collect and prevent silt suffocation if needed.
- Egg loss is monitored and dead eggs are removed to prevent fungal spread from one egg to another.

Section 10. Release

10.1 Proposed fish release levels.

Age Class	Max. No.	Size (ffp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Water-shed	Eco-province
Unfed Fry	200,000	1,200	April	See section 1.11.2	See section 1.11.2	Lewis R.	Lower Col

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

See section 1.11.2

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

See section 10.1. As stated earlier, survival to swim-up approaches 98%. Fish are 38-39 mm fl in length and can range from 900 – 1200 fish/lb.

In 1993, 525,400 fed fry at 1000 ffp were released in April.

10.4 Actual dates of release and description of release protocols.

Fry egress volitionally from the RSIs starting in mid March and have finished by early April depending on individual tributary environmental conditions. If they are confined in stack trays, staff would have to visually inspect that most fry swimming fry have buttoned up and manually release each tray to the stream. Studies on coho emergence from RSIs indicate that coho fry move upstream and downstream with fry found more than 500 m upstream in some systems by June (WDOT, 2002).

10.5 Fish transportation procedures, if applicable.

Not applicable.

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

Typical acclimation procedures are not applied but as RSI fry emerge and during the subsequent rearing cycle that continues for approximately another year they are receiving imprinting cues from the stretch or main area of rearing.

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

No marks are applied.

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

No surplus at the time of release. Only the “release” amount of eggs are allotted to each RSI site.

10.9 Fish health certification procedures applied pre-release.

At this time, no fish health inspection takes place as un-fed fry are released as soon as button up.

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

During eyed egg stage, eggs can be kept moist without water if needed for a considerable period of time. If fry are mostly free swimming, a decision can be made to let fish go.

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.

Size of fry emigrating from the RSIs mimic the natural population of coho and not have a competitive advantage.

Section 11. Monitoring and Evaluation of Performance Indicators

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

Mandatory MOU and annual Volunteer Fish Production Project Records are tracked. Current RSI projects are not otolith marked but research on Cedar Creek (Lewis River) is ongoing using otolith marked eggs. WDFW will be able to RSI contribution of smolts and adults to the system and use those results to evaluate contribution of the Fish First RSIs in other RSI programs.

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

WDFW staff and programs are intact to track volunteer efforts as they are an integral part of the department. The Cedar Creek research is on-going with PacifiCorp contributions.

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.

Coho populations both wild and hatchery are proposed ESA for listings (NOAA 69 FR 33101; 6/14/2004). Scientific protocols for future monitoring or evaluation activities in these streams would be used to prevent risk to wild fish during these activities.

Section 12. Research

12.1 Objective or purpose.

Results from research and monitoring on Cedar Creek (Lewis River) is on-going and RSI performance or contributions will be evaluated based on those findings.

12.2 Cooperating and funding agencies.

WDFW

12.3 Principle investigator or project supervisor and staff.

John Weinheimer

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

Same

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

A trap exists on a grist mill site in the lower Cedar Creek system.

12.6 Dates or time periods in which research activity occurs.

March-June for juvenile smolts and October to February for adults.

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

Biological data is collected from smolts at the Cedar Cr. smolt trap. Smolts are anethetized in MS 222 during the sampling period. Some coho smolts are sacrificed for otolith identification.

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

Coho, are not listed at this time.

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

No take of listed fish reported.

12.10 Alternative methods to achieve project objects.

None, Cedar Creek is an on-going research station.

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

Multiple salmonids utilize Cedar Creek including Chinook, steelhead, and chum. Mortalities are unknown.

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.

See section 9.1.7

Section 13. Attachments and Citations

13.1 Attachments and Citations

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Section 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

14.1 Certification Language and Signature of Responsible Party

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

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____