HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	Cowlitz River Sea-Run Cutthroat
Species or Hatchery Stock	Sea-Run Cutthroat Trout (*Oncorhynchus clarki clarki*)/ Cowlitz Trout Hatchery
Agency/Operator	Washington Department of Fish and Wildlife
Watershed and Region	Cowlitz/Lower Columbia
Date Submitted	
Date Last Updated	April 18, 2005

Section 1: General Program Description

1.1 Name of hatchery or program.

Cowlitz River Sea-Run Cutthroat

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

Cutthroat Trout (*Oncorhynchus clarki clarki*)/Cowlitz Trout Hatchery

ESA Status: In April 1999, NMFS and the USFWS issued a joint proposed rule for the listing of southwestern Washington/Columbia River sea-run cutthroat trout. On July 5, 2002, the USFWS issued a withdrawal of the Proposed Rule to List the Southwestern Washington/Columbia River Distinct Population Segment of the Coastal Cutthroat Trout as Threatened (Federal Register, Vol. 67, No. 129). Not listed and not a candidate for listing at this time.

1.3 Responsible organization and individuals.

Name (and title):	Mark Johnson
	Cowlitz Complex Manager
Agency or Tribe:	Washington Department of Fish & Wildlife
Address:	1182 Spencer Road, Winlock, WA 98596
Telephone:	(360) 864-6135
Fax:	(360) 864-6122
Email:	johnsmjj@dfw.wa.gov

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 Cowlitz Trout Hatchery Facilities Owner
Bonneville Power Administration	Cowlitz Falls Research /Fish Reintroduction Activities, including Stress Relief Pond/Acclimation
Friends of the Cowlitz	Cooperative Organization involved operation of net pens/remote sites for stock enhancement (Lou Reebs Net Pen)

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

Funding Sources
Tacoma Public Utilities
Bonneville Power Administration

Operational Information	**Number**
Full time equivalent staff	8.0
Annual operating cost (dollars)	$985,000.00 (Specific Program costs cannot be broken out)

1.5 Location(s) of hatchery and associated facilities.

Broodstock source	Cowlitz Trout Hatchery
Broodstock collection location (stream, RKm, subbasin)	Cowlitz Trout Hatchery/Cowlitz River/RKm 66.0/Cowlitz Subbasin
Adult holding location (stream, RKm, subbasin)	Cowlitz Trout Hatchery/Cowlitz River/RKm 66.0/Cowlitz Subbasin
Spawning location (stream, RKm, subbasin)	Cowlitz Trout Hatchery/Cowlitz River/RKm 66.0/Cowlitz Subbasin
Incubation location (facility name, stream, RKm, subbasin)	Cowlitz Trout Hatchery/Cowlitz River/RKm 66.0/Cowlitz Subbasin
Rearing location (facility name, stream, RKm, subbasin)	Cowlitz Trout Hatchery/Cowlitz River/RKm 66.0/Cowlitz Subbasin

1.6 Type of program.

Integrated Harvest

1.7 Purpose (Goal) of program.

The goal of the program is transitioning from recreational harvest to helping recover upper basin populations. In the new Settlement Agreement (SA), this will be done by increasing sea-run cutthroat trout abundance in the Tilton River and upper Cowlitz River (upper Cowlitz and Cispus rivers). This will primarily be achieved by reducing impacts from hatchery releases (after conversion to an Integrated Type Program) and improving fish passage survival through the system. An integrated type program (up to 30%) would be implemented by collecting wild fish for use as a portion of the hatchery broodstock. The program would begin when sufficient numbers of wild fish are available for incorporation as broodstock for the hatchery. In the short term, the release of hatchery smolts larger than 210 mm will produce a return to the hatchery of 5000 fish.

1.8 Justification for the program.

The Cowlitz River sea-run cutthroat trout were historically abundant. Kray (1957) estimated a sport catch of 6,000 sea-run cutthroat above Mayfield and at least 20,000 caught on the river yearly. An average of 8,698 cutthroat were counted in 1962 through 1966 at the Mayfield Dam site (Thompson and Rothfus 1969). A minimum of 3,227 to 7,978 juvenile cutthroat were counted moving downstream of the site in 1964 through 1966 (Thompson and Rothfus 1969). The construction of Mayfield and Mossyrock Dams blocked access to much of the historical spawning habitat (Myers et al. 2003). The Cowlitz Salmon Hatchery was completed in 1967 and to mitigate for lost sea-run production, the Cowlitz Trout Hatchery started releasing sea-run throat to the lower river in 1968. The previous mitigation agreement for the Cowlitz Trout hatchery programs (FERC PROJECT # 2016 Aug. 9, 1967) which expired on December 31, 2001 based program performance of steelhead and sea-run cutthroat programs from the trout hatchery on achieving levels of steelhead and sea-run cutthroat totaling 38,600 fish. By the start of the new Settlement Agreement (FERC 2016), sea-run cutthroat returns had progressed to the point of more than 40,000 fish alone based on 50% catch and return to rack success (HGMP Section 1.12). By the late 1990's, most indigenous anadromous populations in the Lower Columbia ESU including the Cowlitz River system were either depressed, proposed for, candidate species or

listed under the Endangered Species Act (ESA). In April 1999, NMFS and the USFWS issued a joint proposed rule for the listing of southwestern Washington/Columbia River sea-run cutthroat trout but later in 2002 issued a withdrawal of the Proposed Rule to List the Southwestern Washington/Columbia River Distinct Population Segment of the Coastal Cutthroat Trout as Threatened.

The new Cowlitz River Hydroelectric Project Settlement Agreement (SA) has prioritized restoring ecosystem integrity with the restoration and recovery of wild, indigenous salmonid runs, including ESA-listed and unlisted stocks, to harvestable levels (The Cowlitz River Project, FERC No. 2016, August 2004). In order to achieve these goals, the existing hatchery stocks will continue to serve as gene banks for native Cowlitz basin stocks of fish and be used to rebuild and restore wild stocks and provide continued harvest opportunities. Along with habitat and fish passage improvements, current operational and after Cowlitz Hatchery Complex remodel and phase in plans (SA Article 7), are described in detail in the Cowlitz River Fisheries and Hatchery Management Plan (SA Article 6). The Cowlitz River Fisheries and Hatchery Management Plan (FHMP) proposal will be to operate hatchery programs rearing salmonids native to the Cowlitz River as Integrated, and all non-native species as Segregated. It is unable at this point to determine the degree to which programs could be integrated per Hatchery Scientific Review Group (HSRG) recommendations of natural origin spawners (NOS) within the current broodstock hatchery program. The Fisheries Technical Committee (FTC) will evaluate the concept of an integrated hatchery program at the Cowlitz Complex in the next iteration of the FHMP after Year 6. If natural production is high enough, at the proposed hatchery production level, approximately a 30% integration rate has been proposed; that is, 30 percent of the brood stock must be wild or natural origin adults from populations above Mayfield Dam (FHMP).

Juvenile monitoring at Cowlitz Falls and Mayfield dams indicates that significant numbers of anadromous sea-run cutthroat trout are still being produced in these basins. For example, during migration years 2000 to 2003, smolt collection numbers at Cowlitz Falls ranged from 967 to 1,323. Thus, based on the low FCE (Fish Collection Efficiency) (<50 percent) at Cowlitz Falls Dam it is likely that the number of smolts passing this project is probably double this range. The production of large numbers of smolts from above the dams is extraordinary given that adult sea-run cutthroat trout were prevented from using these for over 30 years. The program will be consistent with the Cowlitz River Fisheries and Hatchery Management Plan (FHMP) proposal to operate hatchery programs rearing salmonids native to the Cowlitz River as Integrated, and all non-native species as Segregated (The Cowlitz River Project, FERC No. 2016, August 2004). While the implementation of an integrated program, where natural selection in the wild drives the genetic fitness of the population is a goal, upriver productivity.

Tacoma Power's proposal is for a conservative hatchery integration program for recovering the sea-run cutthroat trout population in the Cowlitz River basin. Harvest opportunity is critically important to WDFW and its stakeholders. WDFW believes the FHMP goals can be achieved while still providing harvest opportunities. The sea run cutthroat stock is derived from adults returning to the Cowlitz Barrier Dam and Blue Creek trap (Cowlitz Trout Hatchery) and the size of the program has been tailored to meet harvest objectives, based on the Cowlitz Hydroelectric re-licensing process and research/M&E activities (FERC 2016).

WDFW protects listed fish and provides harvest opportunity on the Cowlitz Hatchery programs though the Lower Columbia Region Fish Management and Evaluation Plan (FMEP) approved by NOAA on December 31, 2003. The primary focus of anadromous salmonid fisheries in the LCR is to target harvest of known hatchery origin steelhead, spring chinook, coho salmon, sea-run cutthroat, and fall chinook. The primary focus for resident game and non-game fish in the LCR tributaries is to 1) provide recreational opportunities, 2) minimize impacts to juvenile anadromous

fish through time and area closures, and 3) minimize impacts to listed species. In addition, the harvest rates for LCR steelhead are less than those adopted by NOAA Fisheries for endangered Upper Columbia River steelhead in the Columbia River mainstem fisheries.

To minimize impact on listed fish by the Cowlitz River Cowlitz River summer steelhead program and operations, a number of risk aversions are included in this HGMP (Table 1).

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

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.2	• Water rights are formalized from the Department of Ecology. • Monitoring and measurement of water usage is reported (monthly NPDES reports).
Intake Screening	4.2	• Intake and screen criteria compliance with NOAA determined. • Structures, updates or needed remodel or fixes assessed.
Effluent Discharge	4.2	• This facility operates under the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit • Conducts effluent monitoring and reporting and operates within the limitations established in its permit • Monthly and annual reports on water quality sampling, use of chemicals at this facility, compliance records are available from DOE. • Discharges from the cleaning treatment system are monitored
Broodstock Collection & Adult Passage	7.9	• Broodstock collection procedures identify listed fish. • Safe handling protocols in place • Listed fish placed back to stream or hauled to the upper basin

1.9 List of program "Performance Standards".

See section 1.10 below.

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

1.10.1 Benefits:

BENEFITS		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Provide hatchery sea-run cutthroat for recreational harvest.	Release up to 160,000 smolts annually or until after rebuild (>2008) production has been determined. Program fish provide a freshwater fishery.	All releases are properly documented. Estimate harvest rates and catch of program fish.
Assure that hatchery operations support the current recovery/mitigation agreement between Tacoma Power and WDFW.	Contribute to a meaningful harvest for sport, tribal and commercial fisheries. Achieve a average of up to 4.71% smolt-to-adult survival that includes harvest plus return of up to 5,000 fish at current production levels).	Survival and contribution to fisheries will be estimated for each brood year released. Work to manage adult fish returning in excess of broodstock need.
Maintain outreach to enhance public understanding, participation and support of Washington Department of Fish & Wildlife (WDFW) hatchery programs	Provide information about agency programs to internal and external audiences. For example, local schools and special interest groups tour the facility to better understand hatchery operations. Off station efforts may include festivals, classroom participation, stream adoptions and fairs.	Evaluate use and/or exposure of program materials and exhibits as they help support goals of the information and education program. Record on-station organized education and outreach events.
Program contributes to fulfilling tribal trust responsibility mandates and treaty rights	Follow pertinent laws, agreements, policies and executive and judicial orders on consultation and coordination with Native American tribal governments	Participate in annual coordination meetings between the co-managers to identify and report on issues of interest, coordinate management, and review programs (FBD process).
Implement measures for broodstock management to maintain integrity and genetic diversity	A minimum of 960 adults are collected throughout the spawning run in proportion to timing, age and sex composition of return Maintain effective population size.	Annual run timing, age and sex composition and return timing data are collected. Adhere to WDFW spawning guidelines. (WDFW 1983)
Program fish are identifiable	Use mass-mark (adipose-fin clip) for selective fisheries (wild steelhead release)	Verify that mark quality goals are being met by mark efficiency checks during marking and at release. Quantify the number of program fish released and observed in the fishery to evaluate survival, performance, contribution to the fishery, and return to the hatchery rack.
Release groups are in a smolted condition	Release groups meet State Steelhead Rearing Guidelines.	Document size, age, and indicators of smoltification including: coefficient of variation (CV), standard deviation (STD) and condition factor (K or C).

Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens. Follow Co-managers Fish Health Disease Policy (1998).	Smolt release groups will meet WDFW fish health standards. Releases will be volitional as much as possible dependent on existing facilities.	WDFW Fish Health Section inspects adult broodstock yearly and monitors juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, WDFW's Fish Health Section recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as deemed necessary A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.
	Release and/or transfer exams	1 to 6 weeks prior to transfer or release, fish are examined in accordance with the Co-managers Fish Health Policy
	Inspection of adult broodstock	At spawning, lots of 60 adult broodstock are examined for pathogens
	Inspection of off-station fish/eggs prior to transfer to hatchery	Control of specific fish pathogens through eggs/fish movements are conducted in accordance to Co-managers Fish Health Disease Policy.

1.10.1 Risks:	**RISKS**	
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Minimize impacts and/or interactions to ESA listed fish	Hatchery juveniles are raised to smolt-size (4.0 fish/lb) and released from the hatchery at a time that fosters rapid migration downstream. Program fish are checked for signs of smolt fitness close to release time.	As identified in the HGMP: Monitor size, number, date of release and mass mark quality.
Production facilities are operated in compliance with all applicable fish health guidelines, facility operation standards and protocols including HOPPS, Co-managers Fish Health Policy and drug usage mandates from the Federal Food and Drug Administration	Hatchery goal is to prevent the introduction, amplification or spread of fish pathogens that might negatively affect the health of both hatchery and naturally reproducing stocks and to produce healthy smolts that will contribute to the goals of this facility.	Pathologists from WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed
Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring	NPDES permit compliance WDFW water right permit compliance	Flow and discharge reported in monthly NPDES reports.
Water withdrawals and instream water diversion structures for hatchery facility will not affect spawning behavior of natural populations or impact juveniles.	Hatchery intake structures accessed with future plans and priority fixes evaluated to meet state and federal guidelines where located in fish bearing streams.	Barrier and intake structure compliance assessed and needed fixes are prioritized.
Hatchery operations comply with ESA responsibilities	WDFW completes an HGMP and is issued a federal and state permit when applicable.	Identified in HGMP and Biological Opinion for hatchery operations.
Harvest of hatchery-produced fish minimizes impact to wild populations	Temporal differences in run timing between hatchery steelhead and wild late winter steelhead. Mass mark release to enable state agencies to implement selective fisheries.	Use trap and collection facilities to document the run times of returning summer steelhead and late winter steelhead.

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

431 females spawned (~ 479 need to be collected) with like amount of males.

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

Age Class	Max. No.	Size (ffp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Water-shed	Eco-province
Yearling	150,000	4.0	April	Blue Creek (RKm 0.8)	78.9	Cowlitz	Lower Columbia
Yearling*	10,000	4.0	April	Cowlitz River (RKm 66.0)	66.0	Cowlitz	Lower Columbia

*Lower River Acclimation and release from FOC (Lou Reebs) Net Pen site.
Note: Up to 100,000 fry and fingerling plants were previously made in the Tilton River and several tributaries. After 2002 these plants were discontinued. Fish produced for the Tilton River for 2003 were stocked in Swofford lake for the resident fishery.

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

The Mitigation agreement for Cowlitz Hatchery (Agreement Number FERC PROJECT # 2016 dated Aug. 9, 1967), expired on December 31, 2001. This agreement based program performance of the steelhead and sea-run cutthroat programs on achieving WDFW/TPU mitigation levels of steelhead and sea-run cutthroat totaling 38,600 fish. This was calculated by combining punchcard steelhead with sea-run cutthroat rack returns to Cowlitz Trout and Salmon hatcheries (Cowlitz Annual Reports, WDFW). This total was 70% of the total adult production. Another 30% was calculated and added in order to include adults for used in hatchery broodstock collection or upper river re-introduction fish. Sea-run rack returns were calculated to represent 50% of total return and percent survival since 1990 has been 4,91 **(Table 2.)**

Under the new license with an effective date of July 18, 2003, mitigation levels will not based on adult return levels but based on hatchery production, upstream passage improvements and future upper river productivity. (Hydroelectric Project, FERC Project No. 2016).

Table 2. Cowlitz Sea-run cutthroat rack returns and percent return

Year	Smolts Planted	Rack Returns	Percent	Plus 50%*
1990	69,203	1,964	2.66	3,928
1991	106,316	2,404	2.69	4,808
1992	109,645	683	0.52	1,366
1993	96,220	1,279	1.18	2,558
1994	92,381	2,232	2.06	4,464
1995	98,865	3,581	3.53	7,162
1996	82,803	812	1.00	1,624
1997	110,127	1,233	1.11	2,466
1998	140,484	5,763	4.10	11,526
1999	130,800	6,122	4.68	12,244
2000	204,572	11,434	5.59	22,864
2001	228,780	7,583	3.31	15,166
2002	277,662	21,977	0.79	43,954
2003	154,005	9,690	5.80	19,300
2004	96,940	20,733**	21.4	41,546

*Rack returns are thought to represent 50% of total return, thus percent survival would be 4.71% Tipping, J. M., D. C. Harmon. 2001. Cowlitz Hatchery Program Evaluation Annual report for 2000. Washington Department of Fish and Wildlife. #FPA01-01.
** Total for 2004 only includes 1-salt returns.

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

The sea-run cutthroat program began when the Cowlitz Trout Hatchery was completed in 1967 with release of fish beginning in spring 1968.

1.14 Expected duration of program.

Sea-run cutthroat production is part of the continued operation of the Cowlitz River Hydroelectric Project, FERC Project No. 2016, now operated under the new license (effective date of July 18, 2003). The license is for a term of 35 years and expires July 18, 2038. The Settlement Agreement (SA) indicates the program would be discontinued after a level of recovery in the upper system occurs. This is contingent upon upper basin productivity, fish passage improvements and the success of a proposed integrated program for the sea-run cutthroat.

1.15 Watersheds targeted by program.

Cowlitz/Lower Columbia

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

1.16.1 Brief Overview of Key Issues

The key issues of the sea-run cutthroat program in regards to ESA listed fish are the impacts of hatchery smolts on listed fish in order to provide a significant lower river fishery. For hatchery sea-run cutthroat, predation, disease and competition along with genetic introgression are impacts on listed fish. There remains concern that the existing hatchery stock which began as a mix of native sea-run cutthroat eggs along with sea-run cutthroat eggs of Beaver Creek stock is separated from wild populations existing in the upper and perhaps lower basin as no wild fish have been incorporated into the broodstock in several generations. Although some Beaver Creek stock was used in the initial culture of the hatchery program and continued into the early to 1970's, subsequent years in the mid-late 1970's utilized wild cutthroat for the program without Beaver Creek influence and are believed to be represented in the current hatchery stock. The sea-run cutthroat trout hatchery program at the Cowlitz Trout Hatchery will be converted to an Integrated Type program as defined by the HSRG. The long-term objective of this program would be to produce 50,000 smolts to meet both conservation and self-sustaining run goals. The hatchery program will terminate upon achieving the self-sustaining run size of 500 adults.

Juvenile monitoring at Cowlitz Falls and Mayfield dams indicates that significant numbers of anadromous sea-run cutthroat trout are still being produced in these basins. For example, during migration years 2000 to 2003, smolt collection numbers at Cowlitz Falls ranged from 967 to 1,323. Thus, based on the low FCE (<50 percent) at Cowlitz Falls Dam, it is likely that the number of smolts passing this project is probably double this range. The production of large numbers of smolts from above the dams is extraordinary given that adult sea-run cutthroat trout were prevented from using these areas for over 30 years (FHMP).

In the short term, the FHMP calls for increasing the survival rate of sea-run cutthroat trout juveniles and adults migrating through the hydroelectric system. Juveniles collected at both Mayfield and Cowlitz Falls dams will continue to be uniquely marked so they may be identified when they return as adults, transported and released into their basin of origin. The run size of both populations will be monitored over time to determine if these populations can be recovered to sustainable levels without human intervention.

1.16.2 Potential Alternatives to the Current Program

Alternative 1: Reduce the program per FHMP proposals A reduction of over 300 percent to 50,000 has been proposed by FHMP after rebuild (>2008). WDFW has made a proposal to reduce the program to a 100,000 smolt level.

Pros: In the new SA, the Cowlitz Complex facilities will be remodeled by 2008 and the production for all indigenous and non-endemic stock programs are being proposed for reductions

(FHMP). In large part, reductions for sea-run cutthroat are proposed in order to reduce the impacts to listed fish. Actual impacts include indirect impacts (predation, competition and genetic introgression) to listed fish from non-endemic stocks. Reducing production might reduce densities in rearing units and provide space for future hatchery programs.

Cons: Reductions are based on reducing indirect potential impacts on listed fish even though specific evaluations have not been conducted. As hatchery production is required to provide adult broodstock for spawning and nutrient enhancement needed for ecosystem productivity, a reduction in the current program could reduce hatchery production below critical hatchery threshold levels that would result in long term harm to the system. It is unknown if avian or mammal predation that occurs on hatchery smolts would then be shifted 100% to listed stocks in this scenario.

Alternative 2: Eliminate the hatchery program as per FHMP. The long term FHMP goal upon achieving the self-sustaining run size of 500 adults is to eliminate the hatchery plants.

Pros: This would eliminate any potential risks to listed species in the system due to indirect impacts including predation, competition, disease and genetic introgression. Space could be used for further reducing hatchery densities for other programs.

Cons: This alternative is not considered acceptable; currently this program supports a very popular sport fishery and significant economic benefits statewide and the Lower Columbia River region. If the program was eliminated, the goals of the Cowlitz Basin Fish Management Plan (WDFW), Cowlitz Fish Hatchery and Management Plan (FHMP) would not be met. Pressure would be shifted to other rivers less capable of sustaining the fishing effort. It is unknown if avian or mammal predation that occurs on hatchery smolts would then be shifted 100% to listed stocks in this scenario.

1.16.3 Potential Reforms and Investments

Reform/Investment 1: There would be a negative impact region wide to reduce the program 300%. Evaluating the impact would require funding.

Reform/Investment 2: Reducing the program per FHMP proposals would size the program to the new remodel design in order to benefit fish culture rearing parameters to produce high quality smolts.

Section 2: Program Effects on ESA-Listed Salmonid Populations

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

None, although NOAA Fisheries has consulted on the operations of all the fish production activities at these facilities as part of a Columbia River basin wide 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 the 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.

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.

Southwestern Washington/Columbia River Cutthroat Trout (*Oncorhynchus clarki clarki*): Listed in 1999, but petition withdrawn in 2002.

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

Lower Columbia River fall chinook salmon (*Oncorhynchus tshawytscha*) are listed as "threatened" under the ESA on May 24, 1999.
Lower Columbia River spring chinook salmon (*Oncorhynchus tshawytscha)* listed as "threatened" under the ESA on May 24, 1999.
Lower Columbia River Steelhead (*Oncorhynchus mykiss)* listed as "threatened" under the ESA on March 19, 1998.
Lower Columbia River Coho salmon (*Oncorhynchus kisutch)* 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).
Lower Columbia River Chum salmon (*Oncorhynchus keta)* listed as "threatened" under the ESA on March 25, 1999.

Cutthroat Trout (*Oncorhynchus clarki clarki)*: In April 1999, NMFS and the USFWS issued a joint proposed rule for the listing of southwestern Washington/Columbia River sea-run cutthroat trout but later in 2002 issued a withdrawal of the Proposed Rule to List the Southwestern Washington/Columbia River Distinct Population Segment of the Coastal Cutthroat Trout as Threatened. Although not listed, the natural populations are a fraction of historical size and considered depressed **(SaSI** 2000**).** In the Cowlitz system, upper basin populations in the Tilton River and Upper Cowlitz will be recovered. According to the criteria listed in the Settlement Agreement, either population will be considered self-sustaining if the R/S value, measured at the Barrier Dam, is greater than 1.0 in three out of five consecutive brood years and the five-year rolling average exceeds an adult abundance level identified by the USFWS. The USFWS has set an interim adult abundance value of 500 (yearly run-size) for both the Tilton River and upper Cowlitz River (1,000 fish total).

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 Cowlitz system **(**Myers et al. 2002), and core/legacy status (McElhany et al. 2003). Natural escapement levels in the lower river below the barrier dam (which include hatchery-origin fish) are typically only 200 to 400

fish (SaSI 2002), although escapement in 2003 and 2004 have increased significantly **(Table 3).** Estimates of adults above Mayfield Dam in the 1960's indicated approximately 9,900 spring Chinook (Serl and Morrill 2004). Currently, significant numbers of adults have been transported the past few years approaching these numbers. Current carrying capacity for spring Chinook smolts in the upper Cowlitz basin is 311,000 smolts (Serl and Morrill 2004). Current productivity in the upper system is approximately 225,000 smolts although less than 40,000 - 45,000 smolts (19%) can be collected at the CFFF (Serl and Morrill 2004). Spring Chinook short and long term objectives for the programs are covered in Section 5.1 (FHMP). Tacoma Power continues to truck adults above the Cowlitz Falls Dam as part of the anadromous reintroduction program**.**

Table 3. Spring Chinook Abundance Estimates in the Lower Cowlitz River

Year	Lower Cowlitz River	Year	Lower Cowlitz River
1990	320	1998	356
1991	284	1999	285
1992	279	2000	266
1993	236	2001	347
1994	167	2002	419
1995	347	2003	1,937
1996	36	2004	1,793
1997	455	2005	

Source – Lower Columbia Region FMEP 2003 and WDFW Spawning Surveys (2004).

Lower Columbia River fall chinook salmon *(Oncorhynchus tshawytscha*): 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). Age ranges from 2-year-old jacks to 6-year-old adults, with dominant adult age of 3, 4, and 5 (averages are 16.49%, 58.05%, and 19.31%, respectively). Natural spawning abundance is more a reflection of the size of returns to the Cowlitz Salmon Hatchery and stray rates than of natural production. The natural spawning escapement goal is 3,000 adults. Until 2001 the goal had not been met since 1989 (SaSI 2002). In 2002, escapement was 1,427 while 2003 had 10,329 and 4,466 were reported for 2004 (**Table 4**). Most of the spawning takes place between the Kelso Bridge and the Cowlitz Salmon Hatchery (WDF et. al. 1993). Fall Chinook will not be used in the upper Cowlitz while the spring Chinook evaluation is ongoing but adults are taken to the Tilton River.

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).

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.

Table 4. Fall chinook salmon abundance estimates in the Cowlitz System.

Year	Coweeman River	Cowlitz River	Green River	SF Toutle River
1990	241	2,698	123	0
1991	174	2,567	123	33
1992	424	2,489	150	0
1993	327	2,218	281	3
1994	525	2,512	516	0
1995	774	2,231	375	30
1996	2,148	1,602	667	351
1997	1,328	2,710	560	0
1998	144	2,108	1,287	66
1999	93	997	678	42
2000	126	2,700	852	27
2001	646	5,013	4,951	132
2002	891	14,427	7,452	444
2003	1,082	10,329	13,806	137
2004	1,550	4,466	4,108	603

Source – LCR FMEP (2003) up to 2001. 2002 – 2004 data from WDFW database.

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 and 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). Late winter steelhead have been reintroduced into the upper system (**Table 5).** The Cowlitz system is not surveyed for steelhead **(Table 6).**

Table 5. Late Winter Steelhead Adults transported to the Upper Cowlitz River Basin, 1996 - present.

Year	UM – Unmarked STHD			RV – Right Ventral Clip			AD – Adipose Clip			Totals
	UM-Female	UM-Male	UM-Jack	RV - Female	RV - Male	RV – Jack	AD-Male	AD – Female	AD - Jack	
1996-7	22	12	0	5	14	0	0	1	0	54
1997-8	6	5	0	5	1	0	26	23	0	66
1998-9	15	24	13	10	29	3	6	49	8	157
1999-2000	108	107	0	28	73	0	19	77	0	412
2000-01	133	125	37	71	122	20	70	124	27	729
2001-02	346	419	1	174	492	1	453	898	3	2,787
2002-03	316	205	2	335	241	0	933	497	3	2,532
2003-4	146	146	4	100	167	0	214	619	1	1,397
2004-5										

Source - *DRAFT* 2004 ANNUAL REPORT FOR THE COWLITZ FALLS PROJECT `

Table 6. Wild winter steelhead abundance estimates in the LCMA.

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

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 kilometer (rkm) 83.2 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 and Cispus rivers. The Washington Department of Fisheries estimated coho escapement at about 32,500 fish in 1951. Coho counts past Mayfield from 1961-66 averaged 24,579. Hatchery-produced returns averaged 24,997 adults and 9,723 jacks in 1980-94 with a peak of 54,685 adults in 1986 and 19,178 jacks in 1987. The Northwest Power Planning Council's model estimated smolt production capacity of 123,123 for the lower Cowlitz River, 131,318 for Tilton River and Winston Creek, and 155,018 for above Cowlitz Falls. Presently, most Cowlitz River coho are of hatchery origin although significant numbers of NOS have been identified and taken to the upper Cowlitz **(Table 7)** and the Tilton River system since 1996 **(Table 8).**

Table 7. Hatchery Coho adults transported to the Upper Cowlitz River Basin, 1996 - present.

Year	UM – Unmarked Coho			AD – Adipose Clipped Coho			Totals
	UM-Female	UM-Male	UM-Jack	AD - Female	AD - Male	AD – Jack	
1996-7	0	0	0	932	594	629	2,155
1997-8	0	0	0	2,774	1,262	464	4,500
1998-9	0	0	0	4,128	4,140	3,154	11,422
1999-2000	2,398	2,383	120	10,594	11,635	7,197	34,327
2000-01	514	778	284	14,653	16,674	9,566	42,469
2001-02	1,150	1,644	96	15,504	21,564	1,497	41,455
2002-03	3,661	4,688	416	23,698	30,490	6,300	69,253
2003-04	3,477	4,511	484	9,526	11,169	6,143	35,310
2004-05							
Totals	11,200	14,004	1,400	81,809	97,528	34,891	240,891

Source - *DRAFT* 2004 ANNUAL REPORT FOR THE COWLITZ FALLS PROJECT

Table 8. Annual numbers of adult fall Chinook (FCK), coho salmon, winter steelhead (WSH), late Winter Steelhead (LWS), and sea-run cutthroat trout adults transported into the Tilton River system from Cowlitz Salmon Hatchery (CSH) by origin, species, and sex.

Year	Hatchery						Wild				
	Species	Females	Males	Jacks	Non sexed	**Total Hatchery**	Females	Males	Jacks	Non sexed	**Total Wild**
1997	FCK	3	24	84		**111**					**0***
	Coho	867	2,766	2,056		**5,689**					
	WSH	293	289		286	**868**	8	11			**19**
	SRCT									79	**79**
1998	FCK	2	98	141		**241**					**0***
	Coho	903	1,106	1944		**3,953**	535	647	460		**1,642**
	WSH	92	158	83		**333**					
1999	FCK		1	72		**73**					
	Coho	2,469	3,058	2,471		**7,998**	573	673	29		**1,275**
	WSH				339	**339**		104			**104**
	SRCT							62			**62**
2000	FCK		1	636		**637**					**0***
	Coho	4,933	6,138	4,006		**15,077**	159	252	85		**496**
	WSH	324	323		7	**654**	72	47			**119**
	LWSH						2	6			**8**
	SRCT										
2001	FCK	397	1,079	1,065		**2,541**					**0***
	Coho	12,569	14,770	1,808		**29,147**	660	1063	156		**1,879**
	WSH	214	320	8		**542**	88	84			**172**
	LWSH						1				**1**
	SRCT									92	**92**
2002	FCK	167	405	16		**588**					**0***
	Coho*	6,165	7,989	1,673		**15,827**	525	661	69		**1,255**
	WSH	477	601	3	451	**1,532**	152	153	1	300	**606**
	LWSH									12	**12**
	SRCT									7	**7**
2003**	FCK	1,968	2,317			**4,285**					**0***
	Coho	3,465	3,341			**6,806**					**617**
	WSH					**0**					**84**
	LWSH					**377**					**74**
	SRCT					**0**					**617**
2004**	FCK					**1,550**					**0***
	Coho					**12,030**					**381**
	WSH					**0**					**319**
	LWSH					**503**					**26**
	SRCT										**69**

Source – Cowlitz Salmon Hatchery annual reports and D. Harmon (2002-2003).
0* Fall Chinook wild/hatchery cannot be determined without mass mark to this point.
** Data for 2003 and 2004 male/female breakdowns not yet available.

Columbia River Chum salmon (*Oncorhynchus keta)* listed as "threatened" under the ESA on March 25, 1999. Chum were reported to historically utilize the lower Cowlitz River and tributaries downstream of the Mayfield Dam site. Typically less than 20 adults are collected

annually at the Cowlitz Salmon Hatchery with adults hauled downstream to suitable spawning habitat areas. In the 1990s November commercial fisheries were curtailed and retention of chum was prohibited in Columbia River sport fisheries.

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

Describe hatchery activities: The following hatchery activities are identified in the ESA Section 7 Consultation "Biological Opinion on Artificial Propagation in the Columbia River Basin" (March 29, 1999). In other HGMPs provided to NOAA (Puget Sound, Upper Columbia), indirect takes from hatchery releases such as predation and competition is highly uncertain and dependant on a multitude of factors (i.e. data for population parameters - abundance, productivity and intra species competition) and although HGMPs discuss our current understanding of these effects, it is not feasible to determine indirect take (genetic introgression, density effects, disease, competition, predation) due to these activities. No listed fish are taken for broodstock. There will be no take tables submitted with this HGMP.

Broodstock Program:

Broodstock Collection: Sea run cutthroat can be trapped from late summer through early winter at Cowlitz Salmon and to a lesser extent at Cowlitz Trout Hatchery. Only identified hatchery fish are retained for spawning.

Genetic introgression: There remains concern that the existing hatchery stock which began as a mix of native sea-run cutthroat eggs along with sea-run cutthroat eggs of Beaver Creek stock is separated from wild populations existing in the upper and perhaps lower basin as no wild fish have been incorporated into the broodstock in several generations. Although some Beaver Creek stock was used in the initial culture of the hatchery program and continued into the early to 1970's, subsequent years in the mid-late 1970's utilized wild cutthroat for the program without Beaver Creek influence and are believed to be represented in the current hatchery stock.

Rearing Program:

Operation of Hatchery Facilities: See HGMP section 4.2 for water withdrawal, intake screening compliance and hatchery effluent discharges.

Disease: The sea-run population in the hatchery is susceptible to *Ceratomyxa shasta*. Thus, hatchery managers must rear these fish on disease-free water during a portion of their rearing cycle. Although Cowlitz Salmon or Cowlitz Trout Hatcheries have been noted as potential sources of fish pathogens including bacterial kidney disease, *Ceratomyxa shasta*, and IHNV, these diseases are also present in the natural spawning populations (Tacoma Power 2000).

Release:

Hatchery Production/Density-Dependent Effects: Current production is at 160,000 smolts. After rebuild (> 2008) hatchery production of summer steelhead has been reduced to 50,000 smolts. This action is designed to reduce possible predation impacts on listed lower river Chinook populations. Once a level of wild cutthroat reaches a minimum of 500 adults to the upper river, the program has been proposed to ending sea run cutthroat plants. While this is possible, discontinuing the program without being evaluated would be giving up a significant fishery.

Competition: Hatchery sea run cutthroat trout smolts are released from the Cowlitz Trout Hatchery in April at a target size of 8.3 in (up to 216 mm fl); trout at this size generally exhibit smolt characteristics and rapidly emigrate. Competition with, and predation on, other salmonids is likely greater when cutthroat trout smolts residualize (LCFRB Basin Plans 2004). Hatchery

cutthroat smolts have the potential to compete for food and space or to prey on juvenile fish in the system, however, competition with native and non-native species in the lower Cowlitz is considered low but should be evaluated. Tipping (1982) reported that sea-run cutthroat trout released in the Cowlitz River in April were still being caught in significant numbers in August and September as initial migrants. These fish were likely residing in the river until the late summer. As many fish are caught as one year salt fish, they do not reside in sea water for long periods of time and are considered estuary inhabitants. Releasing fish at 4.0 fpp.

Predation: Hawkins and Tipping (1999) reported 0.00-2.13% predation rates for sea-run cutthroat. On Chinook fry on the Lewis River, Washington. The predation rates as cited above were associated with extremes in Chinook salmon fry abundance; low predation rates had low spawner densities and high predation rates had high spawner densities. The Lewis River study though correlated predation on the extremely large escapement of fall Chinook produced by that system with substantial increases in predation rates reflecting an increase of nearly 3 times more chinook fry appearing that year from a previous year (Hawkins and Tipping 1999.

Besides individual stock characteristics and abundance of prey, the following Predation Risk Factors have been identified:

Environmental Characteristics: These characteristics can influence the level of predation (see SIWG 1984 for a review) with risk greatest in small systems during periods of low flow and high clarity. The Cowlitz River is a large river system averaging 6,664 and 7,490 cfs during April and May (USGS-Real Time average 1934- present). Below I-5, the Toutle River, a large tributary of the Cowlitz River adds another 2,000 – 2,600 cfs to the system.

Dates of Releases: Steelhead are released mid-April to May 1st. Listed fish can be present in some part of the timing of the steelhead release.

Relative Body Size: Predators were thought to be able to prey on fish up to approximately 1/3 of their length (USFWS 1994), although coho salmon have been observed to consume juvenile chinook salmon of up to 46% of their total length or larger in aquarium environments (Pearsons et al. 1998). The "33% of body length" criterion for evaluating the potential risk of predation in the natural environment has been used by NOAA Fisheries and the USFWS in a number of biological assessments and opinions (c.f., USFWS 1994; NMFS 2002). Although predation on larger chinook juveniles may occur under some conditions, WDFW believes that a careful review of the Pearson and Fritts (1999) study supports the continued use of the "33% of body length criterion" until further data for individual rivers can be collected.

Release Location and Release Type: The release from the Cowlitz Trout Hatchery is to the lower river at RKm 66.1. This is below the upper river productivity. It is likely that a significant portion of migration and dispersal of the hatchery program occurs before peak emergence of listed winter steelhead. Although the release is not totally volitional, most fish quickly vacate the pond as soon as screens are removed.

Residualism: To maximize smolting characteristics and minimize residual sea-run cutthroat, WDFW adheres to a combination of acclimation, release strategies, and size at release (4.0 ffp), and conditions that based on past history indicating smolt characteristics and emigrate rapidly. Condition factors including a leaner .90-.99 K factor close to release.

Migration Corridor/Ocean: It is unknown to what extent listed fish are available both behaviorally or spatially on the migration corridor especially for an estuary type life cycle fish.

Monitoring:

Associated monitoring Activities: In the new SA, interaction between hatchery and wild adult salmonids will be managed by monitoring key tributary escapements of coho, steelhead, cutthroat and chum. Interaction between hatchery-released fish and wild fish in the lower Cowlitz will be studied and may result in review of release strategies.

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

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

Broodstock taken for this program does not take listed fish, therefore take tables will not be submitted with this HGMP.

In other HGMPs provided to NOAA (Puget Sound, Upper Columbia), indirect takes from hatchery releases such as predation and competition is highly uncertain and dependant on a multitude of factors (i.e. data for population parameters - abundance, productivity and intra species competition) and although HGMPs discuss our current understanding of these effects, it is not feasible to determine indirect take (genetic introgression, density effects, disease, competition, predation) due to these activities.

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.

Any additionally mortality from this operation on a yearly basis would be communicated to Fish program staff for additional guidance. For other listed species, if significant numbers of wild salmonids are observed impacted by this operation, then staff would inform the WDFW District Biologist who along with the Complex Manager would determine an appropriate plan and consult with NOAA if needed.

Section 3: Relationship of Program to Other Management Objectives

3.1 Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the *NPPC Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

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

For ESU-wide hatchery plans, the sea-run cutthroat production from Cowlitz Trout 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. 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.

- Cowlitz Basin Fish Management Plan - The Department of Fish and Wildlife has developed a framework for a fish management plan for the Cowlitz River basin. This plan is intended to provide management direction for fish protection and restoration in a manner that is consistent with the Endangered Species Act (ESA) and the Wild Salmonid Policy (WSP). The Wild Salmonid Policy was developed by WDFW in response to a mandate from the Washington State Legislature (ESHB 1309) in 1993.
- Mtigation agreement for Cowlitz Hatchery (Agreement Number FERC PROJECT # 2016 dated Aug. 9, 1967). That license expired on December 31, 2001. The Project has operated under annual licenses until the new license was issued (effective July 18, 2003). The new thirty-five year license was issued March 13, 2003, and became effective on July 18, 2003. Tacoma Power has contracted with the Washington Department of Fish and Wildlife (WDFW) to operate their Cowlitz hatcheries through 2008.

- The Cowlitz Fish Hatchery and Management Plan (FHMP) is part of the new Settlement Agreement (Article 6).
- Lewis County Public Utility District's (PUD) Cowlitz Falls project (FERC No. 2833).

3.3 Relationship to harvest objectives.

WDFW general harvest goals are to provide fishing opportunities consistent with the mandate of the agency for restoration and recovery of wild indigenous salmonid runs, the Pacific Salmon Treaty, the Pacific Fisheries Management Council, *US v. Oregon*, and other state, federal, and international legal obligations. Besides ocean fisheries, specific harvest objectives will vary depending on the phase of the reintroduction and recovery program.

Sea-run cutthroat are harvested in a variety of freshwater sport fisheries in Washington. Although cutthroat are commonly caught in marine fisheries in Puget Sound, few are harvested from the Pacific Ocean. Therefore, the ocean harvest of Cowlitz River fish taken is inconsequential. Commercial fisheries in the mainstem Columbia River are precluded from retaining incidentally encountered cutthroat. Expansion of selective fisheries designed to protect naturally produced salmon should result in an increased level of protection for all cutthroat. Further, most returning cutthroat are too small to be retained in commercially fished nets.

Sport fisheries selective for adipose fin-clipped cutthroat is expected to occur in the mainstem Columbia River and the lower Cowlitz River on a year round basis with a goal of maximum removal of hatchery origin fish. Fisheries directed at the harvest of Cowlitz River sea-run cutthroat operate in the lower Columbia River and in the Cowlitz River downstream of the Barrier Dam. Sport fisheries occur in the lower Columbia and Cowlitz year round. Exploitation rates are not known but could be part of the monitoring program developed for this plan. All HOR cutthroat are adipose clipped. Only adipose clipped fish can be retained in sport fisheries (i.e. all wild fish are required to be released).

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. See also Section 1.12.

Fisheries benefiting from this program will include:

- Columbia River Zone 1-3 recreational fishery
- Lower Cowlitz River recreational fisheries

Fisheries directed at the harvest of Cowlitz River sea-run cutthroat operate in the lower Columbia River and in the Cowlitz River downstream of the Barrier Dam. Sport fisheries occur in the lower Columbia and Cowlitz year round. Exploitation rates are not known. All sea-run cutthroat trout with an intact adipose fin would have to be released in all fisheries throughout the Cowlitz River basin and only HOR cutthroat are adipose clipped and can be retained in sport fisheries (i.e. all wild fish are required to be released). Commercial fisheries in the mainste m Columbia River are precluded from retaining incidentally encountered cutthroat. Expansion of selective fisheries designed to protect naturally produced salmon should result in an increased level of protection for all cutthroat. Further, most returning cutthroat are too small to be retained in commercially fished nets.

3.4 Relationship to habitat protection and recovery strategies.

Along with Tacoma City Light, Lewis River PUD, federal and local government agencies, and local citizens, both technical and policy WDFW personnel participate 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
Cowlitz system habitat protection and recovery strategies in the Columbia River and tributaries have been part of Subbasin Planning processes funded by the Northwest Power Planning Council. 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.

Habitat Treatment and Protection
Ecosystem Diagnosis and Treatment (EDT) compares habitat today to that of the basin in a historically unmodified state. EDT has been modeled for productivity in the Cowlitz basin in The Lower Columbia Salmon Recovery and Fish and Wildlife Sub-basin Plans and has been used by Tacoma Power for the FERC re-liscensing agreements for the upper basin productivity goals. WDFW is also conducting a Salmon Steelhead Habitat Inventory Assessment Program (SSHIAP), which documents barriers to fish passage. WDFW's habitat program issues hydraulic permits for construction or modifications to streams and wetlands. This provides habitat protection to riparian areas and actual watercourses within the watershed.

Limiting Factors Analysis (LFA)
A WRIA 26 LFA was conducted by the Washington State Conservation Commission (May 2002). WRIA 26 was separated into seven subbasins; Coweeman, Lower Cowlitz, Toutle, Mayfield/Tilton, Riffe Lake, Cispus, and Upper Cowlitz.

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.

(1) *Salmonid and non-salmonid fishes or species that could negatively impact the program*: There are high numbers of predators in Mayfield and Riffe Lake Reservoirs, such as northern pikeminnow and rainbow trout, as well as exotic predators, such as tiger muskies, brown trout, large and smallmouth bass, bluegill, crappie, and yellow perch introduced for angling. These predators present a risk to smolts migrating through the lakes or juveniles rearing in the lakes from reintroduction programs. Once below the reservoirs, smolts an be preyed upon through the entire migration corridor from release to the mainstem Columbia River estuary. Northern pikeminnows and introduced spiny rays along the Columbia mainstem sloughs can predate on chinook 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 chinook.

(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 chinook 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.

The Cowlitz Trout Hatchery has three sources of water:

1- 9 shallow wells on both sides of the river supply up to 5 cubic feet per second (cfs). This water is used for initial rearing and to alter water temperature. Water from the North Well has some bacteria and gas problems. Due to this problem, Tacoma Public Utilities (TPU) has installed power to the South Wells until a system upgrade is completed. In the fall of 2000, the North Well was not utilized and may be abandoned.

2- Ozonated river water: A ozone plant is used to disinfect up to 20 cfs of river water. This water is used from May to late November/ early December to avoid pathogens (primarily Ceratomyxa shasta) in the river water. The ozone plant has a auxiliary electrical generator. The plant can not supply the volume of water needed from early December to mid-May. Plant is operational from mid-May to early December. Although a longer operation period would be desirable, capacity of this facility will not allow it.

3- The river intake is able to supply 50 cfs of river water or 20 cfs while the ozone plant is operating. The ozone plant is the first one designed specifically for hatchery use. This plant is capable of producing 200 pounds of ozone daily.

The temperature of the river supply ranges from 4° to 16°C, and only rarely exceeds 15°C, while water supplied from the wells has a more stable thermal regime that ranges from 8° to 12°C (Harza 1997a in FERC 2001). Water discharged from the hatchery into Blue Creek is a little warmer than the Cowlitz River during spring and summer. The DO levels of the Cowlitz Trout Hatchery effluent, which flows into Blue Creek, are typically 1-2 mg/L lower than the Cowlitz River (Harza 2000 in FERC 2001). River water is strictly a backup water source in case of well water system failure. Re used well water from incubation units is redirected to early rearing units.

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

Potential Hazard	Risk Aversion Measure
Hatchery water withdrawal	At Cowlitz Trout Hatchery, fish propagation water rights total almost 87 cfs including incubation water (wells) and surface water and are formalized thru trust water right S2W19839C and others* from the Department of Ecology. Monitoring and measurement of water usage is reported in monthly NPDES reports (see below).
Intake/Screening Compliance	The Cowlitz Trout Hatchery River intake structure complies with NOAA Fisheries' *Anadrommous Salmonid Passage Facility Guidelines and Criteria (draft, January 31, 2004)* for juvenile fish life stages. The approach velocity and screen types are compliant, but concern remains with wild fry in the vicinity of the Trout Hatchery. This is in part due to the greater numbers of fry that could exist downstream of the barrier dam. In the current plans for the Cowlitz River Hatchery rebuild though 2008, no major modification of the intakes at Cowlitz Salmon or Cowlitz Trout Hatcheries are proposed by TPU. TPU is awaiting NOAA's Anadromous Salmonid Passage Facility Guidelines and Criteria policy to determine if the intakes will require upgrading of the intakes and exploring the possibility of new screen materials and end seals meeting draft NOAA criteria. Some type of electrical barrier in the structure might also be considered to improve the existing situation (WPU comments on the Draft Hatchery Complex Remodel and Phase-in Plan). .
Hatchery effluent discharges. (Clean Water Act)	This facility operates under the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit which conducts effluent monitoring and reporting and operates within the limitations established in its permit administered by the Washington Department of Ecology (DOE). WAG 13-1034. Monthly and annual reports on water quality sampling, use of chemicals at this facility, compliance records are available from DOE. Adherence with the NPDES permit will likely lead to no adverse effects on water quality from the program on listed fish. Discharges from the cleaning treatment system are monitored as follows: *Total Suspended Solids (TSS)*C1 to 2 times per month on composite effluent, maximum effluent and influent samples. *Settleable Solids (SS)*C1 to 2 times per week on effluent and influent samples. *In-hatchery Water Temperature* - daily maximum and minimum readings are monitored.

Section 5. Facilities

5.1 Broodstock collection facilities (or methods).

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

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

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

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

Adult fish, and occasionally juveniles, that are to be transported from the Cowlitz Salmon Hatchery fish separation unit are held in one of six 643 cubic feet circular tanks at the adult trap and separator. These tanks are designed to hold up to 1,250 pounds of fish. There are two 1500 gallon tanker trucks capable of hooking to the underside of the circular tanks and receiving fish through displacement of water. This process results in low stress to the adult fish. The trucks are equipped with flumes for planting fish wherever there is adequate access for these trucks along the river or to the Cowlitz Trout Hatchery adult holding ponds.

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

5.3 Broodstock holding and spawning facilities.

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

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

At the Cowlitz Trout Hatchery fish are sorted, if mature and needed for spawning, to a holding area in one of the adult ponds. From this holding area the females are killed and placed on a drying rack out of the pond. After the eggs are taken, males are netted up and placed into a small holding container into which carbon dioxide is diffused. Once the males are anesthetized, they are live spawned and then returned to the pond. 23 (1.7%) 13 (1.9%) 10 (1.5%)

5.4 Incubation facilities.

Incubator Type	Units (number)	Flow (gpm)	Volume (cu.ft.)	Loading-Eyeing (eggs/unit)	Loading-Hatching (eggs/unit)
Shallow Trough (2 tier) with incubation baskets	16	3.5-5.0	7.165/trough	20000 (5 baskets per trough)	21000 (1 basket per trough)

5.5 Rearing facilities.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Flow Index	Max. Density Index
6	Concrete Raceways	2000	80.0	10.0	2.5	330	1.25	0.20
24	Concrete Raceways	5340	100	20	2.67	1000	1.0	0.25
3	Earthen Pond 5.0-Acres	1856000	1450	160	8.0	4000	2.5	0.0027
1	Earthen Pond 2.0 Acre Lake	1113600	870	160	8.0	4000	2.5	0.0054

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

5.6 Acclimation/release facilities.

Sea-run cutthroat are reared in raceways, 2 1/2 and 5 acre earthen ponds at the Cowlitz Trout Hatchery. Specifications are below. In the large ponds, they can be co-reared with the summer steelhead program. The smolts must be trucked out of the raceways (no outlet to the river) to be released while the smolts in the earthen ponds will be a limited volitional release. Water discharged from the raceways can be routed to the adult ponds, the rearing lakes or the pollution abatement ponds, but not directly to the river. Therefore, fish are planted via truck at either the boat ramp at the Cowlitz Salmon Hatchery or the boat ramp at the Cowlitz Trout Hatchery.

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

Sea-run cutthroat are very sensitive to *Ceratomyxa shasta* and it has caused some significant fish mortality in the past. Installation of a ozone treatment facility in 1994 has decreased mortality significantly. The de-nitro towers deteriorated and caused significant gas bubble disease problems during the 1999-2000 incubation phase.

5.8 Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

Safeguards to insure a uninterrupted water supply at the Cowlitz Trout Hatchery include auxiliary power to supply two of the four river water intake pumps, the north well and the ozone plant. All water sources and head boxes of all raceways are equipped with low water alarms. The water intake structure also has an alarm for the river water, south well water and the north well water. All wells and river pumps are also alarmed. The river water is a source of numerous pathogens. This water is disinfected by the ozone plant during the warmer rearing months. Since water is reused between numerous ponds the possibility for the spread of infection is inherent at the facility. Normal fish culture hygiene is practiced. Flooding and muddy water occasionally occurs even though the river level is controlled by three dams.Fish are not reared in multiple facilities or with redundant systems to reduce the risk of catastrophic loss.

Section 6. Broodstock Origin and Identity

6.1 Source.

Adult hatchery-origin sea-run cutthroat returning to the Cowlitz River Trout Hatchery.

6.2.1 History.

Broodstock Source	Origin	Year(s) Used	
		Begin	End
Cowlitz River Sea-Run Cutthroat	N	1968	U
Cowlitz Trout Hatchery Sea-Run Cutthroat	H	1971	Present

A mix of native sea-run cutthroat eggs along with sea-run cutthroat eggs of Beaver Creek stock were used in the initial culture of the hatchery program. Although this mixed practice continued to 1975, subsequent years in the mid-late 1970's utilized wild cutthroat for the program without Beaver Creek influence and are believed to be represented in the current hatchery stock.

6.2.2 Annual size.

All broodstock are from marked hatchery-origin fish released from and returned to the Cowlitz Trout Hatchery (or Salmon Hatchery Fish Collection Facility when needed). Fish returns have been large th epast several years. See section 1.12.

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

Since the mid 1970's, wild cutthroat were utilized in the program up to 1983 when releases were adipose clipped. In the early 1980's, approximately 20% of the cutthroat catch was estimated to be wild fish (Tipping 1981). Since marking in 1983, only hatchery marked fish have been used.

6.2.4 Genetic or ecological differences.

There remains concern that the existing hatchery stock which began as a mix of native sea-run cutthroat eggs along with sea-run cutthroat eggs of Beaver Creek stock is separated from wild populations existing in the upper and perhaps lower basin as no wild fish have been incorporated into the broodstock in several generations. Although some Beaver Creek stock was used in the initial culture of the hatchery program and continued into the early to 1970's, subsequent years in the mid-late 1970's utilized wild cutthroat for the program without Beaver Creek influence and are believed to be represented in the current hatchery stock.

6.2.5 Reasons for choosing.

This stock is chosen to provide harvest opportunity by having a long history of success in the hatchery program in the Lower Columbia Region especially once the water supply minimized *Ceratomyxa Shasta* disease problems.

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

- Only hatchery identified fish are used.
- Holding pond procedures follow IHOT guidelines.
- Other listed fish, if identified, will be released immediately if encountered during the broodstock collection process.

Section 7. Broodstock Collection

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

Adults.

7.2 Collection or sampling design

Fish are collected from ~ July 1 through January at the Cowlitz Trout Hatchery or Cowlitz Salmon Hatchery. Fish are sorted at the Cowlitz Trout Hatchery as infrequent as possible to avoid unnecessary stress. Prior to spawning season all collected fish are sorted by species, sex , new, previously recycled, natural (unmarked) and either returned to river, saved or placed in a resident water depending on policy. There is no selection criteria for size and all fish are randomly selected for spawning. Natural (unmarked fish) are currently not used for spawning. Fish selected for spawning are primarily those sexually mature in November through February. Sea run cutthroat spawning normally begins the first week of December and concludes by the end of December.

7.3 Identity.

All hatchery-origin sea-run cutthroat are adipose-fin clipped. Natural fish are returned to the river.

7.4 Proposed number to be collected:

7.4.1 Program goal (assuming 1:1 sex ratio for adults):
862 total. Approximately 431 pairs are needed. Fecundity can vary considerably from 650 – 1,000 eggs per female.

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

Year	Adults	
	Females	**Males**
Planned	431	431
1995	942	942
1996	1957	1631
1997	246	246
1998	346	346
1999	524	514
2000	471	463
2001	1114	1080
2002	493	567
2003	463	445
2004	371	349

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

Adults surplus to hatchery needs can be marked with an opercule punch and returned to the river for additional sport opportunity or transported to Riffe Lake.

7.6 Fish transportation and holding methods.

Fish are held in trap (100' x 10') until sorted weekly. Then desired fish are placed into separate sections of a holding raceway. Sections are divided by picket racks. Fish are then sorted weekly to determine ripeness.

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

7.7 Describe fish health maintenance and sanitation procedures applied.

Formalin treatments were administered every other day during the adult-holding period.

7.8 Disposition of carcasses.

Spawned carcasses of sea-run cutthroat are considered inedible. Carcasses are buried. Presently no carcasses are provided for nutrient enhancement, primarily for disease (IHNV) concerns

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

There will be no selection for size and all fish will be randomly selected for spawning. Currently, (unmarked fish) will not be used for spawning.

Section 8. Mating

8.1 Selection method.

Adults are collected from July 1 through December. Sea run cutthroat spawning normally begins the first week of December and concludes by the end of December. Normally there are at least 4 or 5 separate egg takes.

8.2 Males.

Males are randomly selected for each days spawning at a 1:1 ratio. Males can be terminated during spawning but more often live stripped and then made available for additional sport opportunities in both then lower or upper river system (Riffe Lake).

8.3 Fertilization.

When spawning activities occur, females are lethal spawned while the males are anesthetized with carbon dioxide and live spawned in anticipation of future spawning purposes and/or enhance the sport fishery.

Beginning with the 2001 brood spawning (December 2000), all spawning is one male to one female. Sperm is added to eggs from one female and after five minutes, the fertilized eggs are disinfected and water hardened in an iodine solution for one hour. After the one hour period, the eggs are combined into 5 fish pools and placed in shallow troughs to incubate.

8.4 Cryopreserved gametes.

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.

An iodiphor solution is used to rinse hands and spawning implements between handling and spawning of each spawning pair. Individuals spawned are randomly selected and there is no selection for size. Spawning occurs over a course of several weeks. Natural, unmarked fish, will not be used for spawning.

Section 9. Incubation and Rearing.

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

Year	Egg Take	Green-Eyed Survival (%)	Fingerling-Smolt Survival (%)
1995	510,000	NA	NA
1996	528,000	NA	NA
1997	184,500	80.6	NA
1998	311,400	72.8	NA
1999	411,200	68.8	NA
2000	370,400	62.5	NA
2001	864,000	67.4	NA
2002	439,316	91.7	NA
2003	421,288	NA	NA
2004	431,357	NA	NA

Egg take goal is 267,000 green eggs although a surplus can be taken.
NA- Not available at this time. Data will be filled in before submittal to NOAA.

9.1.2 Cause for, and disposition of surplus egg takes.

A surplus of eggs have been held in past years to accomplish two goals: 1) to provide a larger gene pool and 2) to provide insurance against losses due to disease (C. shasta and IHN) and predation. If surplus still occurs over and above program needs, eggs are destroyed.

9.1.3 Loading densities applied during incubation.

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

9.1.4 Incubation conditions.

Oxygen levels, flows and temperatures are monitored.

9.1.5 Ponding.

At 10 days after swim up (volitional), in trough, fish are fed when they are about 2,000 fish per pound (fpp). Ponding occurs when fish are from 1,500 fpp to 600 fpp depending on pond space. Lengths are not measured. Ponding begins in mid-February continuing into May. The procedures used for determining when fry are ponded include: Fry are ponded based on visual inspection of the amount of yolk remaining. First ponding generally takes place during the first week of March.

9.1.6 Fish health maintenance and monitoring.

Salmon fungus (*Saprolegniasis)* is the primary concern during incubation requiring daily treatments with formalin at 1:600 for 15 minutes. 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. 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.

No listed fish will be incubated with the beginning of mass marking for the 1997 brood spring chinook. Disinfection procedures are implemented during incubation that prevent pathogen transmission between stocks of fish on site.

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.

Year	Egg Take	Green-Eyed Survival (%)	Fingerling-Smolt Survival (%)
1995	510000	NA	NA
1996	528000	NA	NA
1997	184500	80.6	NA
1998	311400	72.8	NA
1999	411200	68.8	NA
2000	370400	62.5	NA
2001	864000	67.4	NA
2002	439,316	91.7	NA
2003	421,288	NA	NA
2004	431,357	NA	NA

NA – Not available at this time. Will be filled in before submittal to NOAA.

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

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

9.2.3 Fish rearing conditions.

Oxygen levels are normally greater than 10 ppm in incoming water. Temperatures range between 40-54 degrees Fahrenheit at both facilities. The program does NOT use a diet and growth regime that mimics the natural seasonal growth patterns. Ponds are cleaned, on average, every other day throughout their rearing. Effluent from cleaning goes into a pollution abatement pond.

9.2.4 Indicate biweekly or monthly fish growth information (average program performance), including length, weight, and condition factor data collected during rearing, if available.

Rearing Period	Length (mm)	Weight (fpp)	Condition Factor	Growth Rate
February (At Ponding)	NA	2500	NA	
March	NA	900	NA	0.640
April	NA	400	NA	0.556
May	NA	150	NA	0.625
June	77.9	80	4.054 E-04	0.467
July	98.7	40	4.259 E-04	0.500
August	130.2	18	4.125 E-04	0.300
September	151.7	12	4.115 E-04	0.444
October	164.7	10	4.267 E-04	0.167
November	169.9	9.0	4.059 E-04	0.100
December	175.9	7.0	4.298 E-04	0.222
January	185.8	6.0	4.258 E-04	0.143
February	195.1	5.5	4.412 E-04	0.083
March	196.2	5.0	4.093 E-04	0.083
April	208.2	4.0	4.539 E-04	0.200

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

Feeding rates are followed so that fish size is within 10% of program goal each year.
Feed is stored under proper conditions as described by IHOT guidelines. See also 9.2.4.

9.2.6 Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Rearing Period	Food Type	Application Schedule (#feedings/day)	Feeding Rate Range (%B.W./day)	Lbs. Fed Per gpm of Inflow	Food Conversion During Period
Swimup-Fry	Mash/#0	7	3.0-4.0		0.5
Fry	#1 and #2 crumble	7	3.0-4.0		0.7
Fingerling	1.2 mm and 1.5 mm	7	1.5-2.5		0.9
Yearling	2.0 mm	5	1.0-1.5		1.3
Smolt	2.5 mm	57	1.0-1.5		1.5

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

Fish Health Monitoring	Health and disease monitoring is done by pathologists currently budgeted for the Cowlitz Complex. Policy guidance includes: *Fish Health Policy in the Columbia Basin* and *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995). A fish health specialist stationed at Cowlitz Complex inspects fish programs and checks both healthy and if present symptomatic fish. External signs such as lesions, discolorations, and fungal growths will lead to internal examinations of skin, gills and organs. Blood is checked for signs of anemia or other pathogens. Additional tests for virus or parasites are done if warranted.
Disease Treatment	*Renibacterium salmoninarum,* the pathogen that causes BKD in salmonids, is passed from the adult via the egg stage to the juvenile fish. *R salmoninarum* is also transmitted by the water borne route, among fish in the rearing ponds as well as from the hatchery water supply. Fry and fingerling undergo ELISA segregation during rearing, as well as oral prophylactic treatments with Erythromycin. In the standard ponds, fry and fingerlings have been treated with Florinicol for Bacterial Cold Water Disease (BCWD) and Paracide-f for external parasites, fungus and *trichodina* control on holding adults. Infectious Hematopoietic Necrosis Virus (IHNV) from adults can cause low level chronic mortalities during the rearing period. Erythrocytic inclusion body syndrome has occurred in many years and predisposes fish to other diseases, such as bacterial kidney disease (BKD), fungal infections and BCWD. Frequently it occurs concomitantly with these diseases. Formalin baths were also given after marking to prevent cold-water disease and fungus from infecting the clipped area. Fish health and or treatment reports are kept on file.
Sanitation	Mortality is collected and disposed of at a landfill. All equipment (nets, tanks, boots, etc.) is disinfected with iodiphor between different fish/egg lots. Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water. Tank trucks are disinfected between the hauling of adult and juvenile fish. Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

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

The migratory state of the release population is determined by behavior , physical appearance and other criteria.

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

Comparisons of raceway reared and rearing pond (dirt/gravel bottom) reared fish have shown that cutthroat reared in ponds have twice the survival of fish from raceways.

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.

The sea-run population in the hatchery is susceptible to *Ceratomyxa shasta*. Thus, hatchery managers must rear these fish on disease-free water during a portion of their rearing cycle. Because disease-free water is limited, the reduction in program size would increase the amount available for rearing listed native late winter steelhead. When juveniles are culled, it is not done randomly over all segments of the population.

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
Yearling	150,000	4.0	April	Blue Creek (RKm 0.8) and Cowlitz River (RKm 66.0 & 78.9	66.0 and 78.9	Cowlitz	Lower Columbia
Yearling	10,000	4.0	April	Cowlitz River Lou Reebs Net Pens	34.4	Cowlitz	Lower Columbia

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

See also section 10.1.

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

Release Year	Fry Release			Fingerling Release			Yearling Release		
	No.	Date (MM/DD)	Avg size (fpp)	No.	Date (MM/DD)	Avg Size (fpp)	No.	Date (MM/DD)	Avg Size (fpp)
1991							122183	Spring	3.6
1992							153169	Spring	3.6
1993							149690	Spring	4.0
1994							110134	Spring	3.4
1995							180584	Spring	4.0
1996							153825	Spring	4.8
1997							171743	April 15-30	4.4
1998							149308	April 15-30	3.2
1999	51789	U	835				175744	April 15-30	4.7
2000				5658	Aug,ust 31	49.2	285082	April 15-30	4.0
2001	39881	April 12-13	400	23037	May 18-24	183	228780	April 15-30	4.0
2002				105082	May 21-June 12	130	177662	April 15-May 15	3.8
2003				69934	May, 28-June, 03	84.3	167005	April,18-21	3.4
2004							107063	April, 15-25	3.8

Comments:
Note: In 1995 production overage of 65,465 fish @ 4.9 ffp were outplanted into ponds and lakes for sport catch.

In 1999 production overage of 12,024 fish @ 9.2 ffp were outplanted into ponds and lakes for sport catch.

10.4 Actual dates of release and description of release protocols.

See section 10.3 for release dates. At Cowlitz Trout Hatchery, fish are reared and released from the five-acre rearing lake #1.

10.5 Fish transportation procedures, if applicable.

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

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

Release begins April 15 and is completed by May 20. Releases start out as volitional as all four ponds share a common counting facility. Therefore, they must share this release period so ponds / species / races can be enumerated separately. Fish that do not leave volitionally are forced out when lake is lowered and drained in May. Any raceway "reared" fish are trucked out. Release directly from the raceways is not possible.

Friends of the Cowlitz Co-op receive pre-smolts in February-March; these fish are acclimated at Lou Reebs Net Pen site on the lower river and released.

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

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

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

Surplus fish have been planted into Riffe Lake, Swafford Pond and South Lewis County Park pond in the last several years. The sea-run cuttroat sub-smolts are no longer released into Riffe Lake unless an exception has been granted by Region 5 Fish Management.

10.9 Fish health certification procedures applied pre-release.

All fish are examined for the presence of “reportable pathogens” as defined in the PNFHPC disease control guidelines, within 3 weeks prior to release.

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

Contact complex manager who consults with regional manager in Olympia for decision.

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

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

- The sea-run population in the hatchery is susceptible to *Ceratomyxa shasta*. Thus, hatchery managers must rear these fish on disease-free water during a portion of their rearing cycle.
- Releases are consistent with past history indicating the time, size and conditional release of smolts for migration fitness and smoltification occurs within nearly the entire population, which reduces residence time in the river after release.
- Current size of release experiments in the lower river will be used to improve survival and result in additional information needed for life history traits
- Physiological measures, including allowable population fork length standard deviation (STD) and coefficient of variation (CV) maximums, will be used to monitor growth and population variations
- Fish are acclimated for several weeks at the site before release.
- Also, innovative rearing techniques proposed in the settlement hatchery remodel will incorporate semi natural aspects of fish culture including protective pond coloration along with overhead and in-water cover on an experimental basis.
- Fish not reaching smolt guideline size are not released. Fish are planted in Riffe Lake if it is determined that they would not reach size by release in the spring.

Current levels of hatchery production in the Cowlitz River Basin are undergoing ESA consultations between NOAA Fisheries and the WDFW. Artificial propagation activities in this license that will be proposed as part of the FHMP, the Remodeling and Phase-In Plan, and the Disease Management Plan, 19 will undergo a separate ESA consultation as these plans are not developed enough to give a clear understanding of the proposed action on which to consult. Any future hatchery consultation will be in the overall context or to meet the goal of reestablishing self-sustaining population levels consistent with a viable ESU scenario. In other words, viable populations of spring chinook salmon and a contributing population of steelhead will need to be established above the Project. When the plan is updated, NOAA Fisheries will be consulted to determine if re-initiation of the consultation is warranted, pursuant to which NOAA Fisheries will consider the potential for both beneficial and adverse effects to listed species. This section generally considers the direct and indirect effects to listed species that may result from hatchery mitigation actions.

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.

In addition to the regional monitoring activities associated with this program, see section 2.2.3-Monitoring, the Cowlitz Hatchery evaluation Biologist monitors and evaluates the following factors associated with this hatchery program: Condition Factor of hatchery steelhed smolts prior to release, Smolt-to-Adult survival rates of hatchery steelhead releases, Freshwater harvest levels for hatchery program releases. In association with upper Cowlitz watershed recovery efforts, the Cowlitz Hatchery evaluation Biologist also operates the smolt trap at Mayfield Dam. This trap receives emigrating juveniles generated from plants and natural production in the Tilton River watershed.

As part of Tacoma Powers mitigation for the Cowlitz River dams, WDFW is funded to conduct monitoring and evaluation of the fisheries resources in the lower Cowlitz River. These include spawning and population monitoring of wild steelhead and fall chinook, angler surveys, biological sampling of the hatchery escapement and hatchery practice studies. This work is reported in the Cowlitz Fish Biologist Annual Reports (WDFW, Olympia). Populations of wild fall chinook are monitored by aerial redd counts and biological sampling of carcasses for age, mark and other population data. The aerial surveys have been conducted annually since the 1970s. Seining and CWT tagging of fall Chinook juveniles to estimate survival has also begun on the lower river.

The completion of the Surface Collection System and Fish Facilities at the Cowlitz Falls Dam in 1996 marked the beginning of a unique opportunity to restore anadromous salmonids to an estimated 240 linear miles of historically productive habitat in the upper Cowlitz and Cispus watersheds. Since then, WDFW funded by Tacoma Power, has monitored productivity of spring Chinook, late winter steelhead, coho and cutthroat trout. Fish Collection Efficiency (FCE) is monitored by mark-recapture of steelhead, coho and age-zero spring chinook smolts that are marked with visible implant elastomer tags.

The Cowlitz River Fisheries and Hatchery Management Plan is a component of the Cowlitz Hydroelectric Project Settlement Agreement with a large component of monitoring and evaluation of the upper basin recovery. Currently monitoring is being conducted as a component of the Cowlitz Evaluation Program funded by Tacoma Power. Current funded activities include: hatchery broodstock sampling for biological and mark information; Lower Columbia River fall chinook spawning ground surveys for naturally spawning fall chinook, including aerial redd counts and biological and mark examination of carcasses; tributary steelhead spawning ground surveys for abundance; operation of Mayfield Dam juvenile collector to enumerate juvenile out-migration; creel survey of lower Cowlitz and reservoir fisheries; warm water fish population composition and abundance surveys on Mayfield Lake and Swofford Pond, reintroduction of coho, steelhead, and cutthroat into the Tilton River and hatchery production evaluations. These activities focus on the Lower River and Tilton. This plan and future decisions will be guided by a Fisheries Technical Team. Fisheries obligations will be met through a combination of effective upstream and downstream passage, habitat restoration and improvement, and an adaptive management program.

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

Tacoma Public Utilities funds the staffing and support logistics for the program monitoring and evaluation. Staffing is comprised of and derived from a pool of personnel used in fish cultural and pathology related tasks.

11.2 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

Monitoring activities follow scientific protocol in handling listed fish. Smolts handled for data collection such as condition factor, length and weight are anesthetized with MS – 222 and placed in recovery tanks before hauling. At the salmon hatchery separation facility, adults can be transferred via water to water in the tanker truck fish to minimize stress.

Section 12. Research

12.1 Objective or purpose.

There is no current research associated with this program. Below is a list of past research conducted in association with this program:

Tipping J.M. 1998. *Return Rates of Hatchery-Produced Sea-Run Cutthroat Trout Reared in a Pond versus a Standard or Baffled Raceway*. The Progressive Fish-Culturist 60:109-113.

Blankenship, H.L., and J.M. Tipping. 1993. *Evaluation of Visible Implant and Sequentially coded Wire Tags in Sea-Run Cutthroat Trout.* North American Journal of Fisheries Management 13:391-394.

Tipping J.M. 2001. Adult Return Rates of Hatchery Sea-Run Cutthroat Trout Fed by Hand versus Demand Feeders. North American Journal of Aquaculture 63:134-136.

Tipping J.M., and L.H. Blankenship. 1993. Effect of Condition Factor at Release on Smolt-to-Adult Survival of Hatchery Sea-Run Cutthroat Trout. The Progressive Fish-Culturist 55:184-186.

Tipping J.M. 2001. *Adult Returns of Sea-Run Cutthroat Trout Reared in a Seminatural Pond for Differing Periods prior to Release*. North American Journal of Aquaculture 63:131-133.

Tipping J.M. 1988. *Ozone Control of Ceratomyxosis: Survival and Growth Benefits to Steelhead and Cutthroat Trout*. The Progressive Fish Culturist 50:202-210.

Sea-Run Cutthroat Transport Study. 2000. Cowlitz Fish Biologist Annual Report for 1999 FP00-09. WDFW Olympia.

12.2 Cooperating and funding agencies.

Research conducted by WDFW and Funded through Tacoma Power.

12.3 Principle investigator or project supervisor and staff.

Cowlitz Hatchery Evaluation Biologist

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.

No current research. See above studies for information.

12.6 Dates or time periods in which research activity occurs.

No current research. See above studies for information.

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

No current research. See above studies for information.

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

No current research. See above studies for information.

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

None

12.10 Alternative methods to achieve project objects.

No current research. See above studies for information.

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

No current research. See above studies for information.

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

No current research. See above studies for information.

Section 13. Attachments and Citations

13.1 Attachments and Citations

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Bilby, R.E., B.R. Fransen, and P.A. Bisson. 1996. Incorporation of nitrogen and carbon from spawning coho salmon into the trophic system of small streams: evidence from stable isotopes. Can. J. Fish. Aquat. Scit. 53: 164-173.

Cederholm, C.J. et al. 1999. Pacific salmon carcasses: Essential contributions of nutrients and energy for aquatic and terrestrial ecosystems. Fisheries 24 (10): 6-15.

Dawley, E. M., R.D. Ledgerwood, T.H Blahm, R.A. Kirn, and A.E. Rankis. 1984. Migrational Characteristics And Survival Of Juvenile Salmonids entering the Columbia River estuary During 1983. Annual Report to the Bonneville Power Administration, Portland, OR.

Easterbrooks, J. 1980. Salmon production potential evaluation for the Cowlitz River system upstream of the Cowlitz Falls Dam site. Washington Department of Fisheries.

Fuss, H.J., J. Byrne, and C. Ashbrook. 1998. Migratory Behavior and Incidence of Post-Release Residualism of Hatchery Reared Coho and Chinook Salmon Released into the Elochoman River, WDFW Annual Report FPA99-08.

Hawkins, S.W., Tipping, J. M. 1999. Predation By Juvenile Hatchery Salmonids on Wild Fall Chinook Salmon Fry in the Lewis River, Washington. California Fish and Game 85(3):124-129.

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McNeil, W.J. and D.C. Himsworth. 1980. Salmonid ecosystems of the North Pacific. Oregon State University Press and Oregon State University Sea Grant College Program, Corvallis, Oregon.

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Myers, J.M., C. Busack, D. Rawding, and A. Marshall. 2002. Identifying historical populations of chinook and chum salmon and steelhead within the Lower Columbia River and Upper Willamette River Evolutionarily Significant Units. May 10, 2002 Co-manager Review Draft. Willamette/Lower Columbia River Technical Recovery Team.

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Roby, D.D., D.P. Craig, K. Collis, and S.L. Adamany. 1998. Avian Predation on Juvenile Salmonids in the Lower Columbia River 1997 Annual Report. Bonneville Power Administration Contract 97BI33475 and U.S. Army Corps of Engineers Contract E96970049. 70 p.

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WDW (Washington Department of Wildlife), Confederated Tribes and Bands of the Yakima Indian Nation, Confederated Tribes of the Colville Indian Reservation, and Washington Department of Fisheries. 1990. Methow and Okanogan rivers Subbasin, salmon and steelhead production plan. Available from the Northwest Power Planning Council, Portland, OR. WDW 1990

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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:_____