HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	Grays River Hatchery Type S Coho Program
Species or Hatchery Stock	*Oncorhynchus kisutch* Coho Salmon
Agency/Operator	Washington Department of Fish & Wildlife
Watershed and Region	Grays River Subbasin/Columbia River Estuary Province
Date Submitted	nya
Date Last Updated	August 17, 2004

Section 1: General Program Description

1.1 Name of hatchery or program.

Grays River Hatchery Type S Coho Program

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

Coho Salmon (Oncorhynchus kisutch)

ESA Status: One of 21 artificial propagation programs proposed for listing (NOAA 69 FR 33101; 6/14/2004).

1.3 Responsible organization and individuals.

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Co-operators	Role
National Marine Fisheries Service	Mitchell Act Funding Source/Funding Administrator
WDFW	Management
Oregon Department of Fish and Wildlife	Sponsor and Regional Fisheries Management Entity
Clatsop Economic Development Council	Policy

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

Funding Sources
Mitchell Act
SAFE

Operational Information	Number
Full time equivalent staff	5.0
Annual operating cost (dollars)	$340,000 /SAFE funding

Above Operation Information (Full-Time Staff and Annual Operating Cost) Cumulatively Applies To All Grays River Hatchery Related Programs.

1.5 Location(s) of hatchery and associated facilities.

Broodstock source	Grays River Type S Coho
Broodstock collection location (stream, RKm, subbasin)	Grays River Hatchery/West Fork Grays River (Approximately 37.0 RKm from the confluence of the Grays and Columbia River/RKm 3.2/Grays River Subbasin).
Adult holding location (stream, RKm, subbasin)	Grays River Hatchery/West Fork Grays River (Approximately 37.0 RKm from the confluence of the Grays and Columbia River/RKm 3.2/Grays River Subbasin).
Spawning location (stream, RKm, subbasin)	Grays River Hatchery/West Fork Grays River (Approximately 37.0 RKm from the confluence of the Grays and Columbia River/RKm 3.2/Grays River Subbasin).
Incubation location (facility name, stream, RKm, subbasin)	Grays River Hatchery/West Fork Grays River (Approximately 37.0 RKm from the confluence of the Grays and Columbia River/RKm 3.2/Grays River Subbasin).
Rearing location (facility name, stream, RKm, subbasin)	Grays River Hatchery/West Fork Grays River (Approximately 37.0 RKm from the confluence of the Grays and Columbia River/RKm 3.2/Grays River Subbasin).

1.6 Type of program.

Integrated Harvest - (Lower Columbia River)
The proposed integrated strategy for this program is based on WDFW's assessment of the genetic characteristics of the hatchery and local natural population, the current and anticipated productivity of the habitat used by the populations, the potential for successfully implementing an isolated program, and NMFS' proposed listing determination (69 FR 33102; 6/14/2004). Modification of the proposed strategy may occur based upon NMFS' final listing determination and as additional information are collected and analyzed.

1.7 Purpose (Goal) of program.

- Rear and release 150,000 Type S coho smolts into Grays River.
- SAFE Project was initiated in late 1993 with funding by the Bonneville Power Administration under the Northwest Power Planning Council. The goal is to determine the feasibility of creating and expanding terminal fisheries in the Columbia River basin to allow harvest of strong anadromous salmonid stocks. This program involves an onstation release to sustain the Type S coho broodstock at Grays River Hatchery and also includes transferring 220,000 coho subyearlings to the Deep River Net Pens for release from that site.

1.8 Justification for the program.

Production of coho at the Grays River Salmon Hatchery is exclusively for the Select Area Fishery Evaluation (SAFE) program. The SAFE Project was initiated in late 1993 with funding by the Bonneville Power Administration under the Northwest Power Planning Council.

In its 1993 Strategy For Salmon, the Northwest Power Planning Council recommended that terminal fishing sites be identified and developed to harvest abundant fish stocks while minimizing the incidental harvest of weak stocks. The Council called on the Bonneville Power Administration (BPA) to: "Fund a study to evaluate potential terminal fishery sites and opportunities. This study should include: general requirements for developing those sites (e.g., construction of acclimation/release facilities for hatchery smolts so that adult salmon would return to the area for harvest); the potential number of harvesters that might be accommodated; type of gear to be used; and other relevant information needed to determine the feasibility and magnitude of the program. Beginning in 1993, BPA initiated the Columbia River Terminal Fisheries Project, a 10-year comprehensive program to investigate the feasibility of terminal fisheries in Youngs Bay and other sites in Oregon and Washington (BPA 1993). Terminal fisheries are being explored as a means to increase the sport and commercial harvest of hatchery fish while providing greater protection of weak wild salmon stocks. The project will be conducted in three distinct stages: an initial 2-year research stage to investigate potential sites, salmon stocks, and methodologies; a second 3-year stage of expansion in Youngs Bay and introduction into areas of greatest potential as shown from initial stage; and a final 5-year phase of establishment of terminal fisheries at full capacity at all acceptable sites. The goal of the project is to determine the feasibility of creating and expanding terminal, known stock fisheries in the Columbia River Basin to allow harvest of strong anadromous salmonid stocks while providing greater protection to depressed fish stocks.

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

To maximize harvest of returning adults and minimize catch of non-SAFE stocks extremely high harvest rates have been documented by coded wire tag results for coho (98.3%), spring Chinook (92.4%), selected area bright fall Chinook (96.3%), and upriver bright fall Chinook (96.4%). In all spring fisheries combined, impact on Snake River wild spring Chinook was 0-7 adults (0.00% - 0.07%) from 1992-2000. All impacts to upriver bright fall Chinook during 1997-2000 never exceeded 0.1% for all SAFE fisheries combined.

Table 1. Summary of risk aversion measures for the Grays River Coho program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.2	Water rights are formalized thru trust water right S2-08676 from the Department of Ecology. Monitoring and measurement of water usage is reported in monthly NPDES reports.
Intake Screening	4.2	WDFW has requested funding for future scoping, design, and construction work of a new river intake system to meet NOAA compliance (Mitchell Act Intake and Screening Assessment 2002).
Effluent Discharge	4.2	This facility operates under the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) administered by the Washington Department of Ecology (DOE) - WAG 13-1015.
Broodstock Collection & Adult Passage	7.9	The hatchery weir and associated intake facilities need repairs to provide compliant passage.
Disease Transmission	7.9, see also 10.11	*Fish Health Policy in the Columbia Basin*. Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).
Competition & Predation	See also 2.2.3, 10.11	Current risk aversions and future considerations are being reviewed and evaluated for further minimizing impacts to listed fish.

1.9 List of program "Performance Standards".

See below.

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

1.10.1 Benefits:

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Assure that hatchery operations support Columbia River fish Mgt. Plan *(US v Oregon)*, production and harvest objectives (SAFE)	Contribute to a meaningful harvest for sport, tribal and commercial fisheries. Achieve a 10-year average of 1.41% smolt-to-adult survival with a range of 0.331% – 5.733% that includes harvest plus escapement.	Survival and contribution to fisheries will be estimated for each brood year released. Work with co-managers to manage adult fish returning in excess of broodstock need.
Maintain outreach to enhance public understanding, participation and support of Washington Department of Fish & Wildlife (WDFW) hatchery programs	Provide information about agency programs to internal and external audiences. For example, local schools and special interest groups tour the facility to better understand hatchery operations. Off station efforts may include festivals, classroom participation, stream adoptions and fairs.	Evaluate use and/or exposure of program materials and exhibits as they help support goals of the information and education program. Record on-station organized education and outreach events.
Program contributes to fulfilling tribal trust responsibility mandates and treaty rights	Follow pertinent laws, agreements, policies and executive and judicial orders on consultation and coordination with Native American tribal governments	Participate in annual coordination meetings between the co-managers to identify and report on issues of interest, coordinate management, and review programs (FBD process).
Implement measures for broodstock management to maintain integrity and genetic diversity: Maintain effective population size Limit out of basin transfers Maximize available natural origin fish for broodstock	A minimum of 500 adults are collected throughout the spawning run in proportion to timing, age and sex composition of return Interim guidelines for basin transfers	Annual run timing, age and sex composition and return timing data are collected. Adhere to WDFW spawning guidelines. (WDFW 1983)
Region-wide, groups are marked in a manner consistent with information needs and protocols to estimate impacts to natural and hatchery origin fish	Use mass-mark (100% adipose-fin clip) for selective fisheries with additional groups Ad+CWT (30,000/20%) for evaluation purposes	Returning fish are sampled throughout their return for length, sex, and mark
Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens. Follow Co-managers Fish Health Disease Policy (1998).	Necropsies of fish to assess health, nutritional status, and culture conditions	WDFW Fish Health Section inspect adult broodstock yearly for pathogens and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, WDFW's Fish Health Section recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as deemed necessary A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.
	Release and/or transfer exams for pathogens and parasites	1 to 6 weeks prior to transfer or release, fish are examined in accordance with the Co-managers Fish Health Policy
	Inspection of adult broodstock for pathogens and parasites	At spawning, lots of 60 adult broodstock are examined for pathogens
	Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens and parasites	Controls of specific fish pathogens through eggs/fish movements are conducted in accordance to Co-managers Fish Health Disease Policy.

1.10.1 Risks:

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Minimize impacts and/or interactions to ESA listed fish	Hatchery operations comply with all state and federal regulations. Hatchery juveniles are raised to smolt-size (12.0 fish/lb) and released from the hatchery at a time that fosters rapid migration downstream. Mass mark production fish to identify them from naturally produced fish (except CWT only groups)	As identified in the HGMP: Monitor size, number, date of release and mass mark quality. Additional WDFW projects: straying, in stream evaluations of juvenile and adult behaviors, NOR/HOR ratio on the spawning grounds, fish health documented.
Artificial production facilities are operated in compliance with all applicable fish health guidelines, facility operation standards and protocols including IHOT, Co-managers Fish Health Policy and drug usage mandates from the Federal Food and Drug Administration	Hatchery goal is to prevent the introduction, amplification or spread of fish pathogens that might negatively affect the health of both hatchery and naturally reproducing stocks and to produce healthy smolts that will contribute to the goals of this facility.	Pathologists from WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed
Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring	NPDES permit compliance WDFW water right permit compliance	Flow and discharge reported in monthly NPDES reports.
Water withdrawals and in stream water diversion structures for hatchery facility will not affect spawning behavior of natural populations or impact juveniles.	Hatchery intake structures meet state and federal guidelines where located in fish bearing streams.	Barrier and intake structure compliance assessed and needed fixes are prioritized.
Hatchery operations comply with ESA responsibilities	WDFW completes an HGMP and is issued a federal and state permit when applicable.	Identified in HGMP and Biological Opinion for hatchery operations.
Harvest of hatchery-produced fish minimizes impact to wild populations	Harvest is regulated to meet appropriate biological assessment criteria. Mass mark juvenile hatchery fish prior to release to enable state agencies to implement selective fisheries.	Harvests are monitored by agencies and tribes to provide up to date information.

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

150 adults at 1:1 male to female ratio including jacks at up to 2% of males.

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

Age Class	Maximum Number	Size (ffp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Watershed	Ecoprovince
Yearling	150000	12.0	Late April-Early May	West Fork Grays River	3.2	Grays River	Columbia River Estuary

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

Brood Year	SAR (%)	Total Catch	Escapement (BY)
1990	0.0331	58	Na
1991	0.0365	5	1,594
1992	0.0237	15	3,403
1993	0.5712	316	217
1994	0.5042	262	102
1995	Na	Na	169
1996	0.4691	297	54
1997	5.7338	3,695	1,240
1998	1.4320	3,633	659
1999	Na	Na	5,488
2000	Na	Na	21,442
2001	Na	Na	12,900
2002	Na	Na	Na
2003	Na	Na	Na
Avg.	1.41%	1,035	Na

Catch data provided by Andy Appleby (WDFW), 6/3/03. HoR SAR data from Survival Percentages from CWT missing production data for Grays River Hatchery.

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

The first year of operation for this hatchery was 1961. The SAFE funding for this program began in 1994 with SAFE funded coho released starting in 1999.

1.14 Expected duration of program.

It was expected that after 10 years of research then potential expansion to full capacity fishery would begin. A major review (BPA Funding Process) of the Deep River program and the SAFE program as a whole will occur in 2004. The future of the program is uncertain.

1.15 Watersheds targeted by program.

Grays River Subbasin/Columbia River Estuary Province

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

1.16.1 Brief Overview of Key Issues:

This is a support program for the SAFE project. Smolts are released from the station to insure that enough adults will return to the facility to continue the SAFE project.

The Grays River Hatchery has a water supply problem brought on by decades of environmental impacts associated with logging, road building, a slide in the upper watershed, and the associated problems with very heavy rain fall in most winter seasons. At this time, the facility is closed; as it pertains to Mitchell Act funds, due to the short fall in the WDFW CRFD budgets over the past several years and the associated compliance issues that Grays River Hatchery has. The passage and screening at this facility is also out of compliance and difficult to find solutions to. For these reasons, this facility was the first to be closed due to the budget issues. Current program for chum captures a small part of this facility, which has water from a shallow well collection system that is of high quality during the wet months of the year. The agency is looking at how best to move this

activity to the Elochoman/Beaver Creek facilities as an option that will reduce risk and conform to the issues of compliance.

1.16.2 Potential Alternatives to the Current Program:

Alternative 1: Shift the program to Beaver Creek hatchery on the Elochoman River. The option to use Beaver Creek as an alternate for this program, and for some of the lost Grays River closure program, is provided as an option to WDFW Fish Program leadership for consideration at this time.

1.16.3 Potential Reforms and Investments:

Reform/Investment 1: The cost to re-open Beaver Creek (also closed due to CRFD budget shortfall) has two components; 1) the need for start up costs and 2) the need for re-configuring the hatchery for chum. These costs will be far less than the capitol needs for Grays River compliance and future operations. Cost Estimate: 1) start up $$ and 2) annual operations $$$

Reform/Investment 2: The Grays River Hatchery has need for significant capital investment to solve the water quality, and compliance issues. These would likely require a change in the intake from the upstream gravity system to a pump system, that would not cause a de-water circumstance during the dry months of the year. Further action would be required to solve the bed load build up that threatens the facility on most winter heavy storm periods $$$$

The hatchery program is a part of a strategy to meet conservation and/or harvest goals for the target stock. The tables below indicate what the short- and long-term goals are for the stock in terms of stock status (biological significance and viability), habitat and harvest. The letters in the table indicate High, Medium, or Low levels for the respective attributes. Changes in these levels from current status indicate expected outcomes for the hatchery program and other strategies (including habitat protection and restoration).

	Biological Significance	Viability	Habitat
Current Status	H	M	M
Short-term Goal	H	M	M
Long-term Goal	H	M	H

Section 2: Program Effects on ESA-Listed Salmonid Populations

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

Biological Assessment For The Operation Of Hatcheries Funded by The National Marine Fisheries Service (March 99), Statewide Section 6 consultation with USFWS for interactions with Bull Trout, and concurrent with this HGMP to satisfy Section 7 consultations: WDFW is writing HGMP's to cover all programs produced from and released at Grays River Hatchery and facilities.

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

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

ESA listed stock	Viability	Habitat
Fall Chinook-Natural	L	M
Chum	H	L
Coho- Hatchery and Natural (Proposed)	Na	Na
H, M and L refer to high, medium and low ratings, low implying critical and high healthy.		

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

Identify the ESA-listed population(s) that will be directly affected by the program.
Lower Columbia River Coho (Oncorhynchus kisutch) is proposed as threatened (June 14, 2004).

Identify the ESA-listed population(s) that may be incidentally affected by the program.
Lower Columbia River fall Chinook salmon *(Oncorhychus tshawytsch*a) are federally listed as "threatened" under the Endangered Species Act.
Columbia River chum salmon *(Oncorhychus ket*a) - Mainstem Chum were listed as threatened under the ESA on March 25, 1999.

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

Lower Columbia River Coho (Oncorhynchus kisutch) is proposed as threatened (June 14, 2004).
Status: NMFS concludes that the LCR coho ESU includes all naturally spawned populations of coho salmon in the Columbia River and its tributaries from the mouth of the Columbia up to and including the Big White Salmon and Hood Rivers. Twenty-one artificial propagation programs are considered to be part of the ESU as NMFS has determined that these artificially propagated stocks are genetically no more than moderately divergent from the natural populations (NMFS, 2004b). Late stock coho (or Type N) were historically present in the Grays basin with spawning occurring from late November into March. Early stock coho (or Type S) are also present in the basin and are produced at Grays River Hatchery. Columbia River early and late stock coho produced from Washington hatcheries are genetically similar. Grays River wild coho run is a fraction of its historical size. USFWS surveys in 1936 and 1937 indicated coho presence in all accessible areas of the Grays River and its tributaries; no population estimate was made. WDF estimated 2,500 natural spawning late coho in the Grays River in 1951. Hatchery production accounts for most coho returning to Grays River. Natural spawning of early stock coho is

presumed to be very low; natural production of late stock coho is likely less then 15% of historic smolt density capacity. Smolt density model estimated basin potential to be 125,874 smolts(LCFRB Volume II, Chapter 4 Grays River Subbasin).

Lower Columbia River fall Chinook salmon *(Oncorhychus tshawytscha*) are federally listed as "threatened" under the Endangered Species Act.

Fall chinook are native to the Grays River. This is now a mixed stock with wild production. A native population of fall chinook existed in the Grays River prior to the construction of Grays River Hatchery in 1960. Until recently, significant portions of the fall chinook spawners in the Grays River were hatchery strays. The fall chinook program at the Grays River Hatchery ended in 1998. The present population is a probably mix of native and hatchery-origin fish with life history characteristics common to those of other lower Columbia River tule fall Chinook stock (**SaSI** 2002). Stock mixing very likely began when hatchery supplementation was initiated in 1947 (WDF et al. 1993). The majority of spawning takes place in a 3.6-mile area from the covered bridge on the mainstem (RM 10.7) to the Grays River Salmon Hatchery on the West Fork Grays (RM 1.2). Spawning occurs from late September to mid-November (WDF et al. 1993). In the early 1950s, there was an estimated escapement of 1,000 fall chinook to the Grays River (WDF 1951). Seining in 1979 captured few naturally-produced, fall Chinook juveniles. This evidence suggests that few natural fall chinook juveniles were being produced (WDF et al. 1993). Natural spawning escapements from 1967 to 1991 averaged 745 fish, with a low return of 147 in 1967 and a peak of 2,685 in 1978. Grays River Chinook salmon stock status is rated Depressed in 2002 because of a long-term negative trend and a short-term severe decline in escapements in 1997, 1998 and 2000. Generally, lower Columbia tule fall chinook stocks, including Grays fall chinook, experienced poor survival in the 1990s.

Table 2. Fall chinook salmon abundance estimates in the LCMA (FMEP 2003)

Year	Cowee-man River	Elocho-man River	Grays River	Skamo-kawa Creek	Cowlitz River	Green River	Toutle River	Kalama River	EF Lewis River	NF Lewis River	Washougal River	Wind River Bright	Wind River Tule
1990	241	136	287	123	2,698	123		20,54	342	17,506	2,062	177	11
1991	174	178	188	123	2,567	123	33	5,085	230	9,066	3,494	269	52
1992	424	190	4	150	2,489	150		3,593	202	6,307	2,164	51	54
1993	327	274	40	281	2,218	281	3	1,941	156	7,025	3,836	686	0
1994	525	688	47	516	2,512	516	0	2,020	395	9,939	3,625	1,101	11
1995	774	144	29	375	2,231	375	30	3,044	200	9,718	2,969	278	4
1996	2,148	508	351	667	1,602	667	351	10,630	167	14,166	2,821	58	166
1997	1,328	1,875	12	560	2,710	560		3,539	307	8,670	4,529	220	148
1998	144	220	93	1,287	2,108	1,287	66	4,318	104	5,929	2,971	953	202
1999	93	707	303	678	997	678	42	2,617	217	3,184	3,105	46	126
2000	126	121	89	852	2,700	852	27	1,420	323	9,820	2,088	25	14
2001	646	2,354	251	4,951	5,013	4,951	132	3,714	530	15,000	3,901	217	444
2002	Na	Na	Na	Na	Na	Na	Na	Na	Na	Na	Na	Na	Na
2003	Na	Na	Na	Na	Na	Na	Na	Na	Na	Na	Na	Na	Na

Columbia River chum salmon *(Oncorhychus keta*) - Mainstem Chum were listed as threatened under the ESA on March 25, 1999. Stock status is rated Depressed in 2002 because of chronically low escapements. This is a native stock with composite production. A hatchery supplementation program designed to increase numbers of naturally spawning Grays River fall chum began at the

WDFW Grays River Hatchery in 1998 (**SaSI** 2002).

Recent stream enhancement work by the Washington Fisheries Department in Gorley Springs (RM 12) had been relatively successful until an upstream dike failed and the river changed course and now flows through the Gorley Springs channel. Other areas such as Crazy Johnson Creek can be quite productive if water flows are adequate. The lack of stable spawning habitat is considered the primary physical limitation on chum production today. Development of other spring-fed spawning areas such as Gorley Springs could improve subbasin chum production. Seasonal low flows sometimes restrict access of chum to preferred off-channel spawning areas, confining them to less stable mainstem reaches. Some mainstem reaches where chum spawn are subject to frequent channel shifts and bedload deposition or scour, all of which reduce intragravel survival. Adults migrate into the river from mid-October through November with peak spawner abundance occurring in late November. Scale analysis indicates 3- and 4-year-old fish are the dominant age classes. During low flow years, chum spawn primarily in the mainstem Grays River; during higher flows they can be found in larger numbers in the smaller tributaries.

Chum are believed to enter the river in October and November and reach their spawning peak in early November. Chum spawn in the mainstem Grays from the covered bridge to approximately 0.5 mile upstream of the West Fork confluence (approximately 4 miles). Tributary spawning occurs in the West Fork (RM 13.0), Crazy Johnson Creek (RM 13.3), and Gorley Creek (RM 12) during November and December (WDF et al. 1993). They are also reported to spawn in Fossil Creek (RM 12.4), and Hull Creek (RM 8.2) (Ames and Bergh 1971). In the 1970s, chum spawning index areas existed in Sweigiler Creek (RM 4.1 of the West Fork Grays) and in the South Fork Grays River (RM 17.7) (Jim Fisher and Associates 1999). Wahkiakum Conservation District reports chum spawning in Klints Creek (RM 11.9). In 1973, WDF reported chum presence in Seal Creek (RM 0.15 on Seal Slough) and Malone Creek (RM 2.1), but does not state whether they were spawning in these creeks (Smith et al 1954).

Table 3. Peak spawning ground counts for chum salmon in index reaches in the LCMA (M Groesbeck WDFW; Streamnet).

Fall Chum Return Year	Grays River				Hamilton Creek			Hardy Creek
	Mainstem	West Fork	Crazy Johnson Creek	Total	Spawning Channels		Total	
					Hamilton	Spring		
1990	569	0	117	686	35	16	51	192
1991	327	37	239	603	8	11	19	206
1992	3,881	491	374	4,746	141	8	149	1,153
1993	2,334	113	91	2,538	16	4	20	395
1994	42	0	105	147	47	22	69	435
1995	219	0	483	702	4	16	20	214
1996	1,302	408	463	2,173	5	81	86	273
1997	79	55	485	619	31	114	145	105
1998	154	214	145	513	43	237	280	443
1999	222	100	927	1,249	17	165	182	157
2001	1,124	833	249	2,206	56	143	199	20
2002	448	1,630	1,260	3,338	226	462	688	498
2003								

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

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

Broodstock Program:

Broodstock Collection: Type S coho begin entering the Grays River system in late August thru September. Coho arrive at the Grays Hatchery in mid-September and can continue thru November. Coho volitionally enter the ladder and holding pond. A river wide weir is not used as in the past, so any adults volunteer into the hatchery. Any listed Chinook that would enter the pond during this time are monitored and released upstream of this point. See Table 1 for direct take.

Genetic introgression: Spawning activity peaks between October 20 and November 1. The only data collected on natural escapement has been incidental to directed fall chinook surveys and no estimates of annual escapements are available. All adults recruited for use as broodstock have been of hatchery origin since 1998. In 2004, WDFW is proposing to maximize the number of natural origin fish into the broodstock. There are no known genotypic, phenotypic, or behavioral differences between either the hatchery stock or natural stock in the subbasin. Straying rates are unknown. Indirect take from genetic introgression is unknown.

Rearing Program:

Operation of Hatchery Facilities: Facility operation impacts include water withdrawal, hatchery effluent, and intake compliance with impact on listed fish unknown but monitoring and maintenance are conducted along with staff observations. Water withdrawal is permitted, intake and screening compliance has been assessed and solutions identified. Hatchery effluent discharges fall within NPDES guidelines.
Indirect take from this operation is unknown.

Disease: Outbreaks in the hatchery may cause significant adult, egg, or juvenile mortality. Over the years, rearing densities, disease prevention and fish health monitoring have greatly improved the health of the programs at Grays River Hatchery. Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1994) chapter 5 have been instrumental in reducing disease outbreaks. Although pathogens occur in the wild and fish might be affected, they are believed to go undetected, as predation would quickly remove those fish. In addition, although pathogens may cause post release mortality in fish from hatcheries, there is little evidence that hatchery origin fish routinely infect natural populations of salmon and steelhead in the Pacific Northwest (Enhancement Planning Team 1986; Foot et al. 2000; Stewart and Bjornn 1990). Prior to release, the coho population health and condition is established by the Area Fish Health Specialist. This is commonly done 1-3 weeks pre-release and up to 6 weeks on systems with pathogen free water and little or no history of disease. Indirect take from disease is unknown.

Release:

Hatchery Production/Density-Dependent Effects: Hatcheries can release numbers of fish that exceed the density of the natural productivity in a limited area for a short period and can compete with listed fish. Grays River Type S coho releases since 1999 have ranged from 150,000 to 200,000 and are mass marked to provide intensive select fisheries and provide protection for

listed fish. The current production of 150,000 is approximately a 60% reduction from the period from 1995-1998. Indirect take from density dependent affects is unknown.

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

1) As discussed above, coho salmon and steelhead released from hatchery programs as smolts typically migrate rapidly downstream. The SIWG (1984) concluded that "migrant fish will likely be present for too short a period to compete with resident salmonids." Fish released from hatcheries in large rivers may travel very rapidly – migration rates of approximately 20 river miles per day were observed by steelhead smolts in the Cowlitz River (Harza 1998).
2) NMFS (2002) noted that ".where interspecific populations have evolved sympatrically, chinook salmon and steelhead have evolved slight differences in habitat use patterns that minimize their interactions with coho salmon (Nilsson 1967; Lister and Genoe 1970; Taylor 1991). Along with the habitat differences exhibited by coho and steelhead, they also show differences in foraging behavior. Peterson (1966) and Johnston (1967) reported that juvenile coho are surface oriented and feed primarily on drifting and flying insects, while steelhead are bottom oriented and feed largely on benthic invertebrates."
3) Flagg et al. (2000) concluded, "By definition, hatchery and wild salmonids will not compete unless they require the same limiting resource. Thus, the modern enhancement strategy of releasing salmon and steelhead trout as smolts markedly reduces the potential for hatchery and wild fish to compete for resources in the freshwater rearing environment. Miller (1953), Hochachka (1961), and Reimers (1963), among others, have noted that this potential for competition is further reduced by the fact that many hatchery salmonids have developed different habitat and dietary behavior than wild salmonids." Flagg et al (2000) also stated "It is unclear whether or not hatchery and wild chinook salmon utilize similar or different resources in the estuarine environment."
4) Fresh (1997) noted that "Few studies have clearly established the role of competition and predation in anadromous population declines, especially in marine habitats. A major reason for the uncertainty in the available data is the complexity and dynamic nature of competition and predation; a small change in one variable (e.g., prey size) significantly changes outcomes of competition and predation. In addition, large data gaps exist in our understanding of these interactions. For instance, evaluating the impact of introduced fishes is impossible because we do not know which nonnative fishes occur in many salmon-producing watersheds. Most available information is circumstantial. While such information can identify where inter- or intra specific relationships may occur, it does not test mechanisms explaining why observed relations exist. Thus, competition and predation are usually one of several plausible hypotheses explaining observed results."
5) Studies from Fuss (2000) on the Elochoman River and Riley (2004) on two Willapa Bay tributaries (Nemah and Forks Creek), indicate that hatchery reared coho and Chinook can effectively leave the watershed within days or weeks.

Predation: Coho yearlings from this program may prey upon listed species of salmonids, but the magnitude of predation will depend upon the characteristic of the listed population of salmonids, the habitat in which the population occurs and the characteristics of the hatchery program (e.g.. release time, location, number released and size of fish upon release). The site specific nature of predation and the limited number of empirical studies that have been conducted, make it difficult to predict the predation effects of this specific hatchery release. WDFW is unaware of any studies

that have been empirically estimated the predation risks to listed fish by this program.

Predation Risk Factors:

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 Grays River is a small to medium sized rain fed stream with historical flows ranging from a high winter event of 7,000 cfs to a low of 25-40 cfs during late summer and early fall (Historical Date USGS website) During April to May flows are dropping from approximately 200 – 300 cfs to approximately 100 cfs.

Dates of Releases: The release date can influence the likelihood that listed species are encountered. There are limited studies on migration timing of naturally produced Chinook but listed Chinook from the Lower Columbia ESU are believed to emigrate over a wide window from March thru August (LCFRB Technical Report 2004). Chum are present in the mainstem Columbia from the Grays River and Sea Resources chum restoration programs.

Relative Body Size: Studies and opinions on size of predator/prey relationships vary greatly and although there is evidence that salmonids can prey upon fish up to 50% of their body length, most prey consumed is probably much smaller. Keeley and Grant (2001) suggest that the mean prey size for 100-200 mm fl salmonids is between 13-15% of predator body size. Salmonid 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 in aquarium environments (Pearsons et al. 1998). Artic char are well known as piscivorous predators, but recent studies suggest the maximum prey size is approximately 47% of their length (Finstad et al. 2002). 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" for listed species until further data for this system can be collected.

Release Location and Release Type: The likelihood of predation may also be affected by the location and the type of release. Other factors being equal, the risk of predation may increase with the length of time that fish co-mingle. In the freshwater environment, this is likely to be affected by distribution of the listed species in the watershed, the location of the release and the speed at which fish released from the program migrate.

We have provided a summary of empirical information and a theoretical analysis of competition and predation interactions that may be relevant to the Grays River Hatchery coho program.

Potential Grays River Type S coho predation and competition effects on listed salmonids: The proposed annual production goal for this program is 150,000 fish. Grays River coho programs start volitional releases in early May. This release of coho could encounter emerging or emigrating chinook and chum in the Grays River subbasin and Columbia mainstem. Due to size differences and habitat preferences between coho smolts and listed stocks competition is likely low. At 11.0 fpp potential impact on listed chinook and chum would be on fish of 50 mm fl and smaller. Release of the coho is timed after chum emigration has been completed in early May.

Below are some data available for chinook and chum fry and fingerling lengths from area Lower Columbia streams. Indirect take due to predation is unknown.

- Lengths from the Lewis River system during the month of June indicate fish 48-55 mm fl (Columbia River Progress Report 2003-16). The Lewis River system fall chinook stock timing though is the latest for the Columbia tributary stocks, and considered to be the worst case scenario (smaller size) when compared to other Columbia River systems.
- Abernathy Creek (WRIA 25) indicated lengths of 36mm – 40mm from March to April 1 (Hanratty pers comm. 2004). Growth for wild chinook from Abernathy Creek from the first of April to May 1 is unknown.
- Average fork lengths by week from 26 sampling sites on the Kalama River indicate fish 44 mm fl (April 25), 46 mm fl (May 3), 56 mm fl (May 11) and 62 mm fl (May 16). Other lengths thru August are available (Pettet WDFW 1990).
- Fork lengths from Cedar Creek (tributary to the N.F. Lewis River) indicate that average Chinook lengths reach approximately 50 mm fl between the weeks of April 12 and April 19, 2004, and are growing rapidly with fish 55-60 mm fl by April 26 and May 3, 2004.
- Mean lengths from the Grays River Hatchery and Sea Resources (Chinook River) Chum Recovery programs indicate chum releases as: 56.2 – 58.8 mm fl (in mid-March), 55.2 mm fl (late March), and 54.6 mm fl in mid-April (Lower Columbia Chum HGMP 2004). For the Duncan Creek and Ives Island Chum Recovery programs, fish are released at 1.0-1.5 grams or 50-55 mm fl on a staggered basis from mi-March through May (Bonneville Population of Columbia River Chum Salmon HGMP 2004). Chum from Duncan Creek appear to complete emigration by late April (Figure 1).

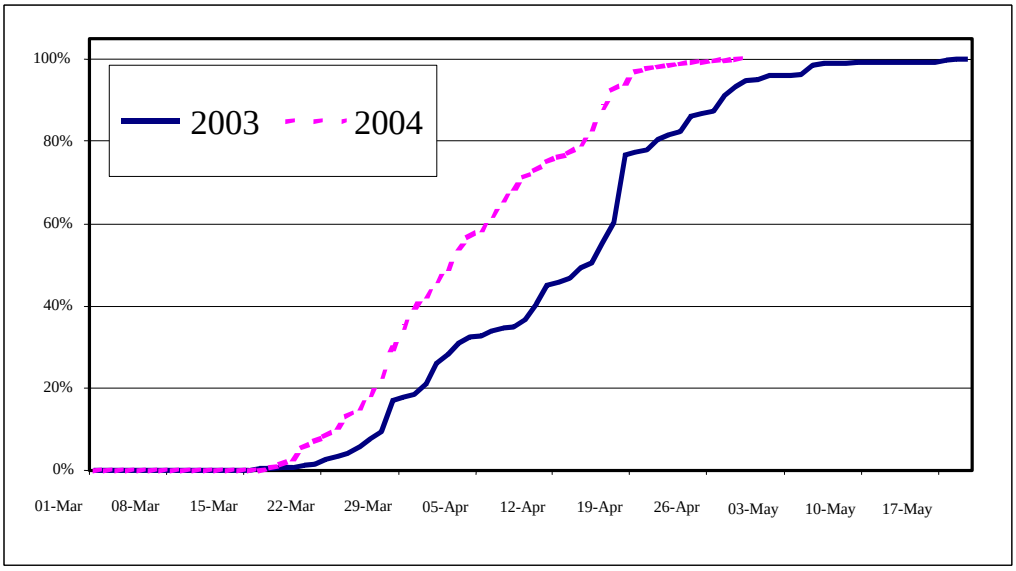

Figure 1. Chum salmon out migration timing at Duncan Creek for Brood Year 2002 & 2003.

Listed Coho (Proposed:
Current lengths and data for proposed listed coho in the Elochoman basin are unknown. Depending on water temperatures, hatchery coho fry during the month of April can range from 42 – 40 mm fl and reach 50 mm fl by early May (Elochoman coho fry data 2001). Indirect take from predation and competition is unknown.

Residualism: To maximize smolting characteristics and minimize residualism:

- WDFW adheres to a combination of acclimation, volitional release strategies, size, and time guidelines.

- Condition factors, standard deviation and coefficient of variation are monitored and measured through out the rearing cycle and adjusted towards the release time for optimum smolt conditions.
- Releases have occurred from acclimation facilities on the parent river.
- In 1996 and 1997, snorkeling studies were conducted on the Elochoman River to examine possible residualism and migration trends of coho (Type N and S) and fall Chinook releases. For 1996, a total of 1.7 million coho smolts were released in staggered periods from early April to mid-May. Snorkeling at 7 sites below the release point indicated no hatchery smolts remaining two weeks after the last release. Release strategies were a combination of volitional and forced. In 1997, a much reduced program of 300,000 coho smolts were volitionally released in mid-April and snorkeling surveys indicated that no hatchery coho were observed by early July. In 1998, after volitional and flush releases ending May 11, no hatchery coho were observed in the middle and lower reaches downstream of the release point one week later (Fuss, June 2000).

Indirect take from residualism is unknown.

Monitoring:

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

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

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

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, Fish Health Specialist, or Area Habitat Biologist who, along with the Complex Manager, would determine an appropriate plan and consult with NOAA for adaptive management review and protocol.

Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.
No data available

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 Select Area Fishery Evaluation Project (SAFE) is 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.

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

Genetic Manual and Guidelines for Pacific Salmon Hatcheries in Washington. These guidelines define practices that promote maintenance of genetic variability in propagated salmon (Hershberger and Iwamoto 1981). Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).

Spawning Guidelines for Washington Department of Fisheries Hatcheries. Assembled to complement the above genetics manual, these guidelines define spawning criteria to be use to maintain genetic variability within the hatchery populations (Seidel 1983). Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 7, IHOT 1995).

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

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

National Pollutant Discharge Elimination System Permit Requirements This permit sets forth

allowable discharge criteria for hatchery effluent and defines acceptable practices for hatchery operations to ensure that the quality of receiving waters and ecosystems associated with those waters are not impaired.

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

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

- Selected Area Fishery Evaluation (SAFE)
- Columbia River Terminal Fisheries Project
- Columbia River Compact
- Final Environmental Assessment of Lower Columbia Terminal Fisheries Research Project
- The Columbia River Fish Management Plan
- U.S. vs. Oregon court decision
- Production Advisory Committee (PAC)
- Technical Advisory Committee (TAC)
- Integrated Hatchery Operations Team (IHOT) Operation Plan 1995 Volume III.
- Pacific Northwest Fish Health Protection Committee (PNFHPC)
- In-River Agreements: State, Federal, and Tribal representatives
- Northwest Power Planning Council Sub Basin Plans
- Washington Department of Fish and Wildlife Wild Salmonid Policy

3.3 Relationship to harvest objectives.

3.3.1) Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available. Coho returning to the Columbia River are managed according to two major stocks. The early-returning fish are referred to as the south-turning or S-type fish because they contribute well to the more southern ocean fisheries. The late-returning coho are referred to as north-turning or N-type fish because they contribute more heavily to the northern ocean fisheries.

Until recent years, naturally produced Columbia River coho were managed like hatchery fish and subjected to similar harvest rates; ocean and Columbia River combined harvest rates ranged from 70% to over 90% during 1970-83. Ocean fisheries were reduced in the mid 1980s to protect several Puget Sound and Washington coastal wild coho populations. Columbia River commercial coho fishing in November was eliminated in the 1990s to reduce harvest of late Clackamas wild coho. Since 1999, returning Columbia River hatchery coho have been mass marked with an adipose fin clip to enable fisheries to selectively harvest hatchery coho and release wild coho. Naturally produced lower Columbia River coho are beneficiaries of harvest limits aimed at Federal ESA listed Oregon Coastal coho and Oregon State listed Clackamas and Sandy River Coho. During 1999-2002, fisheries harvest of ESA listed coho was less than 15% each year. Hatchery coho can contribute significantly to the lower Columbia River gill net fishery; commercial harvest of early coho is constrained by status of fall chinook and Sandy River coho management; commercial harvest of late coho is focused in October during the peak abundance of hatchery late coho. A substantial estuary sport fishery exists between Buoy 10 and the Astoria-Megler Bridge; majority of the catch is early coho, but late coho harvest can also be substantial. An average of 94 coho (1978-1986) were harvested annually in the Grays River sport fishery. CWT data analysis of 1994, 1996, and 1997 brood early coho releases from Grays River Hatchery indicates 43% were captured in a fishery and 57% were accounted for in escapement. Fishery CWT recoveries of 1994, 1996, and 1997 brood Grays early coho were distributed between Columbia River (58%), Oregon ocean (21%), Washington ocean (19%), and

California ocean (1%) sampling areas (LCFRB Technical Report May 2004).

Brood Year	SAR (%)	Total Catch
1990	0.0331	58
1991	0.0365	5
1992	0.0237	15
1993	0.5712	316
1994	0.5042	262
1995	Na	Na
1996	0.4691	297
1997	5.7338	3,695
1998	1.4320	3,633
1999	Na	Na
2000	Na	Na
2001	Na	Na
2002	Na	Na
2003	Na	Na
Avg.	1.41%	1,035

3.4 Relationship to habitat protection and recovery strategies.

Subbasin Planning and Salmon Recovery:
The current Grays River HGMP processes are designed to deal with existing hatchery programs and potential reforms to those programs. A regional sub-basin planning process (Draft Grays River Subbasin Summary May 17, 2002) is a broad-scale initiative that will provide building blocks of recovery plans by the Lower Columbia Fish Recovery Board (LCFRB) for listed fish and may well use HGMP alternative ideas on how to utilize hatchery programs to achieve objectives and harvest goals. In order to assess, identify and implement restoration, protection and recovery strategies, WDFW Region 5 staff is involved in fish and wildlife planning and technical assistance in concert through the LCFRB including the role of fish release programs originating from Grays River Hatchery.

Habitat and Protection Processes:
WDFW is presently conducting or has conducted habitat inventories within the Grays River subbasin. Ecosystem Diagnosis and Treatment (EDT) compares habitat today to that of the basin in a historically unmodified state. It creates a model to predict fish population outcomes based on habitat modifications. WDFW is also conducting a Salmon Steelhead Habitat Inventory Assessment Program (SSHIAP), which documents barriers to fish passage. WDFW's habitat program issues hydraulic permits for construction or modifications to streams and wetlands. This provides habitat protection to riparian areas and actual watercourses within the watershed. The Washington Department of Fish and Wildlife also administers the Washington State Hydraulic Code (RCW 75). This law requires that anyone wishing to use, divert, obstruct, or change the natural flow or bed of any waters of the state to first secure a Hydraulic Project Approval (HPA) from WDFW, so that potential harm to fish and fish habitat can be avoided or corrected. 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:
A WRIA 25 (Grays-Elochoman) habitat limiting factors report (LFA) has been completed by the Washington State Conservation Commission (Wade G., January 2002) with the input of WDFW Region 5 staff. The Grays River suffers from severe habitat degradation (siltation, poor water

quality). This is the result of widespread ongoing logging in the watershed. Freshwater and estuarine ecosystems have been degraded by past and present human activities that have reduced the habitat quality, quantity, and complexity. The primary land use activities responsible for these include: road building, timber harvesting, agriculture, and rural development. These upslope and riparian activities have increased sediment, altered woody debris availability and recruitment, increased water temperatures, changed runoff patterns, and reduced river flow.

3.5 Ecological interactions.

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

(1) Salmonid and non-salmonid fishes or species that could negatively impact the program: Coho smolts can be preyed upon thru the entire migration corridor, from the river subbasin to the mainstem Columbia River and estuary. Northern pikeminnows (beginning at RM 4.0) and introduced spiny rays along the Columbia mainstem sloughs can predate on coho smolts as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons. Mammals that can take a heavy toll on migrating smolts and returning adults include: harbor seals, sea lions, river otters, and Orcas.

(2) Salmonid and non-salmonid fishes or species that could be negatively impacted by the program: Co-occurring natural salmon and steelhead populations in local tributary areas and the Columbia River mainstem corridor areas could be negatively impacted by program fish. Of primary concern are the ESA listed endangered and threatened salmonids: Snake River fall-run Chinook salmon ESU (threatened); Snake River spring/summer-run Chinook salmon ESU (threatened); Lower Columbia River Chinook salmon ESU (threatened); Upper Columbia River spring-run Chinook salmon ESU (endangered); Columbia River chum salmon ESU (threatened); Snake River sockeye salmon ESU (endangered); Upper Columbia River steelhead ESU (endangered); Snake River Basin steelhead ESU (threatened); Lower Columbia River steelhead ESU (threatened); Middle Columbia River steelhead ESU (threatened); and the Columbia River distinct population segment of bull trout (threatened). Listed fish can be impacted thru a complex web of short and long term processes and over multiple time periods which makes evaluation of this 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. Multiple programs including spring Chinook and steelhead programs are released in the Grays River system and natural production of chinook, coho, chum and steelhead occurs in this system along with non-salmonid fishes (sculpins, lampreys and sucker etc.). Accept for yearling stocks (coho and steelhead), these species may serve as prey items during the emigration thru the basin. While not always desired from a production standpoint, hatchery fish provide an additional food source to natural predators that might otherwise consume listed fish and may overwhelm established predators providing a beneficial, protective effect to co-occurring wild fish. 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. Many watersheds in the Pacific Northwest appear to be nutrient-limited (Gregory et al. 1987; Kline et al. 1997) and salmonid carcasses can be an important source of marine derived nutrients (Levy 1997). Carcasses from returning adult salmonids 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).

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

Section 4. Water Source

4.1 Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile and natural limitations to production attributable to the water source.

Water rights total 22,448 gpm from three sources: the West Fork Grays River, an unnamed stream, and wells. Most of the water is supplied by gravity flow from a river intake. During the summer and fall months, virtually the entire river flow is diverted for hatchery use. Water from a 3,800 liter/min capacity well is mainly used for incubation and must be pumped into the hatchery. Gravity-fed water can also be obtained from "Auxiliary Creek" and from the Grays River. The intake on the river is approximately 0.33 miles upstream from the hatchery on the West Fork Grays River. There is also one well that supplies water to the incubators and four raceways.

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.

Hatchery water withdrawal	Water rights total 22,448 gpm from October to June and are formalized thru trust water right #S2-08675 from the Department of Ecology. Monitoring and measurement of water usage is reported in monthly NPDES reports (see below).
Intake/Screening Compliance	Intakes and screens need assessment for compliance.
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 13-1015. 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 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.

Section 5. Facilities

5.1 Broodstock collection facilities (or methods).

Broodstock are collected by volitional return to Grays River Hatchery. In past years a temporary weir was placed in the river adjacent to the hatchery but is no longer used.

Ponds (number)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
2	Adult Holding Ponds	12000	60	40	5.0	450-800

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

Transportation for adults is not needed.

5.3 Broodstock holding and spawning facilities.

Type-S coho enter the Columbia River by mid-August and begin entering tributary streams in early September. Adults at Grays River volitionally enter the holding ponds via fish ladder. Trapping is done on a continuous basis from September thru mid-November with brood stock held in the concrete holding ponds. The holding ponds are supplied by gravity-fed Grays River water. Spawning activity peaks between October 20 and November 1. Fish are tested for ripeness weekly and egg takes are spread out over three weeks. If needed, back up eggs are taken at Toutle Hatchery.

5.4 Incubation facilities.

A series of two deep troughs are used (Deep Trough Dimensions: 15.0 inch. X 14.0 inch. X 18.0 inch.= 2.1875 cubic feet), two deep troughs equals one series. 10-15 gpm of flow is run through each series. There are 18 half-stacks (9 full stacks). 3-5 gpm is run through each half-stack.

5.5 Rearing facilities.

The hatchery has 10 standard concrete raceways, two large adult holding ponds that double as juvenile release ponds, and one large earthen juvenile release pond.

5.6 Acclimation/release facilities.

Releases normally occur from the earthen juvenile release pond.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Flow Index	Max. Density Index
1	Earthen Pond	60000	200	50.0	6.0	700	3.0-3.5	nya

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

Flooding and associated debris and sediments chronically affect fish production programs at this facility. Typically, this can happen during sensitive stages of incubation, which can result in the loss of eggs.

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.

- All pumps, broodstock holding, incubation and rearing receptacles have water loss alarms.
- Staff is available 24/7 to respond to pump failure, water loss, and flooding events.
- Fish health protocols thru broodstock collection, incubation and rearing phases are followed and monitored monthly.
- Broodstock collection is checked daily for program and listed fish.

Section 6. Broodstock Origin and Identity

6.1 Source.

The broodstock is representative of Type S coho that are currently used for hatchery programs within the Lower Columbia ESU. Eggs from adults returning to the hatchery are always given priority for on-station use. Approximately 50% of the coho run enters the holding ponds with coho able to spawn naturally upstream of the hatchery. Importing eggs from other facilities has been done when insufficient adults were available.

6.2.1 History.

In addition to local broodstock, N. F. Toutle River Hatchery Type S Coho were used as needed from 1961 until 1997. Since removal of the temporary weir in 1998 all adults recruited for use as broodstock have been of hatchery origin. There are no known genotypic, phenotypic, or behavioral differences between either the hatchery stock or natural stock in the subbasin.

6.2.2 Annual size.

290 adults at a 1:1 ratio of males and females are needed minus jacks.

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

All adults recruited for use as broodstock have been of hatchery origin since 1998 (mass marked broodstock selected only) but starting in 2004, staff will maximize the number of natural spawners into the broodstock program.

6.2.4 Genetic or ecological differences.

The broodstock is derived from stock returning to the subbasin. All adults recruited for use as broodstock have been of hatchery origin since 1998. There are no known genotypic, phenotypic, or behavioral differences between either the hatchery stock or natural stock in the subbasin. During years where insufficient numbers of adults return, eggs may be obtained from the Toutle River Type-S hatchery coho if available.

6.2.5 Reasons for choosing.

The stock has a run entry pattern and timing that provides harvest opportunities for fisheries in the subbasin, the lower Columbia mainstem/tributaries, Washington/Oregon Coast. The stock is the strength of the Columbia River contribution to the Washington coastal fisheries especially in zones 1 & 2 (Illwaco, Westport, WA). Combination of Type N and Type S stocks provide an extended period of quality catch in both the fresh water recreational and commercial fisheries.

The early stocks contribute heavily to the Buoy 10 coho fishery at the mouth of the Columbia River. They also return to the tributaries when the weather is warmer and stream flows are moderate providing excellent sport fishing opportunities.

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.

- Integrating natural spawners will represent the natural type S coho run through out the season.
- Limit out of basin transfers except in rare circumstances.
- There are no known genotypic, phenotypic, or behavioral differences between either the hatchery stock or natural stock in the subbasin.
- 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).

Adult coho.

7.2 Collection or sampling design

Program broodstock volitionally enter the holding ponds in early October and continuing until late November. The intake structure and dam direct adult fish to the trap entrance, which leads directly to adult gravel holding pond. The spawning operation typically occurs during the month of October. For 2002, spawning dates were weekly on October 15, 22 and 29th, which represent the first third of the run. Needs beyond broodstock and carcass enhancement are released upstream. In 2004, staff will incorporate natural coho adult into the broodstock program.

7.3 Identity.

Type-S coho enter the Columbia River by mid-August and begin entering tributary streams in early September. Spawning activity peaks between October 20 and November 1.

7.4 Proposed number to be collected:

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

700

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	Jacks
Planned	350	350	7
1990	550	658	1120
1991	1479	1924	60
1992	108	109	2
1993	38	64	1
1994	66	103	13
1995	nya	nya	nya
1996	92	65	4
1997	328	328	3
1998	30	29	102
1999	203	301	8
2000	6200	6450	330
2001	3450	3100	121

Data from 2000 and 2001 includes rack escapement. Broodstock collection for those years are approximately 200 – 300 pairs.

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

Surplus hatchery origin fish can released upstream of the hatchery after broodstock and carcass enhancement needs are met.

7.6 Fish transportation and holding methods.

Fish transportation is not needed.

7.7 Describe fish health maintenance and sanitation procedures applied.

The adult holding area is separated from all other hatchery operations. All equipment and personnel use disinfection (chlorine) procedures upon entering or exiting the area. Fish treatments are rare and only for fungus control using formalin bath treatments.

7.8 Disposition of carcasses.

Spawned carcasses can be used for nutrient enhancement. After this, fish can be sold on contract or donated to food banks.

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.

- Coho will be collected throughout the run time from adults arriving at the hatchery rack.
- Limit out of basin transfers except in rare circumstances.
- Additional natural coho are presumed to spawn through out the system, as there is no rack to prevent fish from moving upstream of the hatchery.
- Broodstock collection and sorting procedures can quickly identify listed fish if encountered.

Section 8. Mating

8.1 Selection method.

Ripe fish are randomly selected for a given days spawning. Normally, spawn days are weekly throughout the period with an emphasis on the first third of the run.

8.2 Males.

If available, jacks are used at a rate of 2 (2%) per 100 males spawned.

8.3 Fertilization.

For daily egg takes, eggs from five females are spawned into a bucket, and the sperm from five males are then combined with the eggs.

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.

- Listed coho will be collected through out the run time from adults arriving at the hatchery rack.
- Limit out of basin transfers except in rare circumstances.
- Mating cohorts are selected randomly.
- Protocols for population size, fish health disinfection and genetic guidelines followed.

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 (%)	Eyed-Ponding Survival (%)	Egg Survival Perfor-mance Std.	Fry-fingerling Survival (%)	Rearing Survival Perfor-mance Std.	Fingerling-Smolt Survival (%)
1990	1216000	nya	nya	nya	nya	nya	nya
1991	1573700	nya	nya	nya	nya	nya	nya
1992	16800	nya	nya	nya	nya	nya	nya
1993	83400	nya	nya	nya	nya	nya	nya
1994	123000	nya	nya	nya	nya	nya	nya
1995	nya	nya	nya	nya	nya	nya	nya
1996	273300	nya	nya	nya	nya	nya	nya
1997	634000	nya	nya	nya	nya	nya	nya
1998	81000	nya	nya	nya	nya	nya	nya
1999	292112	nya	nya	nya	nya	nya	nya
2000	1007485	nya	nya	nya	nya	nya	nya
2001	1117500	nya	nya	nya	nya	nya	nya
2002	456,000						
2003	456,000*						

*Draft numbers only.

YEARLY AVERAGE OVER PERIOD OF 1990-1994 AND 1996-2001:

Green-Eye Egg Survival (%)= 91.8

Eyed-Ponding Survival (%)= 90.1

Fry-Fingerling Survival (%)= 90.2

Fingerling-Smolt Survival (%)= 95.2

9.1.2 Cause for, and disposition of surplus egg takes.

Surplus eggs may be used to backfill production shortages if needed at other lower Columbia facilities. Also for lower Columbia River stations, egg takes can be heavily weighted to the first part of the run if escapement appears to be unlikely at the beginning of the season due to low water environmental conditions during September and early October. To preserve later run timed takes, early eggs can be disposed of after consultation with Region WDFW staff.

9.1.3 Loading densities applied during incubation.

Eggs are placed in deep troughs to the eye stage then moved to stack incubators for hatching. Removal of dead eggs, accurate enumeration and loadings are adjusted during this time. See

section 5.4 for load and hatching criteria. Integrated Hatchery Operations Team (IHOT) species-specific incubation recommendations are followed for water quality, flows, temperature, substrate and incubator capacities.

9.1.4 Incubation conditions.

Integrated Hatchery Operations Team (IHOT) species-specific incubation recommendations are followed for water quality, flows, temperature, substrate, and incubator capacities. Harmful silt and sediment is cleaned from incubation systems regularly while eggs are monitored to determine fertilization and mortality. Incubation water temperature is monitored by thermograph and recorded and temperature units (TU) are tracked for embryonic development. Dissolved oxygen content is monitored and have been at acceptable levels of saturation with a minimum criteria of 8 parts per million (ppm). When using artificial substrate, vexar or bio-rings, egg densities within incubation units are reduced by 10%.

9.1.5 Ponding.

Fry are ponded when: a visual inspection of the amount of yolk sac remaining with the yolk slit closed to approximately 1 millimeter wide (approximately 1600 TUs) or based on (95% yolk absorption) KD factor. At this time fry are transferred to the appropriate starter raceway (See HGMP Section 5.5 for raceway specifications) during the last two weeks of January.

9.1.6 Fish health maintenance and monitoring.

Staff conducts daily inspection, visual monitoring and sampling from eye, fry fingerling and sub-yearling stages. As soon as potential problems are seen, these concerns are immediately communicated to the WDFW Fish Health Specialist. In regular monitoring, Fish Health Specialists conduct inspections monthly. Potential problems are managed promptly to limit mortality and reduce possible disease transmission. Records on inspections are kept at the hatchery.

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.

- IHOT and WDFW fish health guidelines are followed.
- Multiple units are used in incubation.
- Splash curtains can isolated stack incubators.
- Temperature, dissolved oxygen and flow is monitored.

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.

YEARLY AVERAGE OVER PERIOD OF 1990-1994 AND 1996-2001:

Green-Eye Egg Survival (%)= 91.8

Eyed-Ponding Survival (%)= 90.1

Fry-Fingerling Survival (%)= 90.2

Fingerling-Smolt Survival (%)= 95.2

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

In all facilities within Grays River Hatchery Complex, densities are kept at or below 3.3 lbs /gpm and 0.5 lbs /cu ft. before the last loading reduction in the fall of the year. Trough maximum

loading is 40 lbs at 12 gpm (3.33 lbs/gpm). Tank and raceway maximum loading for early rearing is 132 lbs for the tanks at 40 gpm (3.3 lbs/gpm) and 800 lbs per raceway at 300 gpm. (2.66 lbs/gpm). The final loading per raceway is approximately 3200 lbs. at 300 gpm (10.6 lbs/gpm).

9.2.3 Fish rearing conditions.

Fish are reared on river. Temperature, dissolved oxygen, flow rates, pond turn over rate and Total settable Solids (TSS) are monitored. IHOT standards are followed for: water quality, alarm systems, predator control measures (netting) to provide the necessary security for the cultured stock, loading and density. Settleable solids, unused feed and feces are removed regularly to ensure proper cleanliness of rearing containers. All ponds are broom cleaned as needed and pressure washed between broods. Temperature and dissolved oxygen are monitored and recorded daily during fish rearing. Ponds are vacuum cleaned on an as needed basis, generally weekly. Netting covers the rearing ponds to minimize predation.

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	Hepatosomatic Index	Body Moisture Content
January	U	800	nya	NA	nya	nya
February	U	400	nya	0.500	nya	nya
March	U	300	nya	0.250	nya	nya
April	U	220	nya	0.364	nya	nya
May	U	160	nya	0.273	nya	nya
June	U	130	nya	0.188	nya	nya
July	U	90	nya	0.308	nya	nya
August	U	60	nya	0.333	nya	nya
September	U	40	nya	0.333	nya	nya
October	U	32	nya	0.200	nya	nya
November	106	30	nya	0.063	nya	nya
December	122	25	nya	0.167	nya	nya
January	126	22		0.120		
February	Na	20		0.091		
March	Na	14		0.300		
April	151	12		0.143		

Shortly after the end of April, fish are close to release in early May.

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

Same as above, see section 9.2.5.

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
January 1-February 28	Moore Clark Nutra Starter 0	7 days/week	2.0	0.0366	1.0:1.52
February 17-March 16	Moore Clark Nutra Starter #1	7 days/week	1.5	0.04	1.0:1.52
March 17-May 31	Moore Clark Nutra #2	4 days/week	0.80	0.043	1:1.14
June 1-July 2	Moore Clark Nutra 1.2 mm	5 days/week	1.0	0.06	1.0:1.08
July 3-August 17	Moore Clark Nutra 1.5 mm	3 days/week	1.25	0.55	1.0:1.54
August 18-November 30	Moore Clark Nutra 2.0	4 days/week	0.65	0.11	1.0:1.03
December 1-April 29	Moore Clark Nutra 2.5	3 days/week	0.53	NA	1:1:47

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

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

Besides time, size and past history, aggressive swarming against pond walls, a silvery physical appearance and loose scales during feeding events are signs of smolt development. From past history, hatchery specialists will reduce feed regimes in early spring as fish show signs of smolting. Also at this time feed conversions fall and fish appear leaner with condition factors falling below 1.0 (K) to .90 (K). Staff can observe smolt ratios during final length frequency measurements upon release. ATPase activity is not measured.

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

None

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

- At least 500 adults are available in the population.
- Limit out of basin fish or egg transfers except in rare circumstances.
- Coho will be collected through out the run time from adults arriving at the hatchery rack.
- Protocols for population size, fish health disinfection and genetic guidelines followed.
- Eggs water hardened in iodophor (1:600).
- Multiple incubation and rearing units are used.
- Staff is available 24/7 to respond to emergencies.
- IHOT guidelines are followed for rearing, release and fish health parameters.

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	150000	12.0	Late April-Early May	West Fork Grays River (@ Grays River Hatchery) approximately 37.0 RKm from the confluence of the Grays and Columbia River	3.2	Grays River	Columbia River Estuary

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

Coho are released from the Grays River Hatchery located on the West Fork Grays River located 3.2 RKm from the confluence of the Grays River approximately 37.0 RKm from the Columbia River.

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

	Fry Release			Fingerling Release			Yearling Release		
Release Year	No.	Date (MM/DD)	Avg size (fpp)	No.	Date (MM/DD)	Avg Size (fpp)	No.	Date (MM/DD)	Avg Size (fpp)
1991	nya	nya	nya	nya	nya	nya	375400	April	15.5
1992	nya	nya	nya	nya	nya	nya	371800	April	16.5
1993	nya	nya	nya	nya	nya	nya	364000	April	16.0
1999	nya	nya	nya	nya	nya	nya	213696	May	12.0
2000	nya	nya	nya	nya	nya	nya	148563	May	11.0
2001	nya	nya	nya	nya	nya	nya	214630	May	12.0
2002	nya	nya	nya	nya	nya	nya	154707	May	10.5
2003							Na	May	
Avg	nya	nya	nya	nya	nya	nya	nya	nya	nya

10.4 Actual dates of release and description of release protocols.

In 2003, coho were released from the earthen juvenile release pond starting May 1. The coho are typically volitionally released during evening/nighttime and optimum tidal phases (high-outgoing) to improve survival of program fish.

10.5 Fish transportation procedures, if applicable.

Fish are not transported for release.

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

All program fish are released from on-station into the West Fork Grays River. Fish have been reared on West Fork Grays River water from incubation to yearling stages.

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

30,000 (20%) of the program production are adipose/CWT marked as an index group for management purposes. The remainder of the production (120,000) is Ad Clipped. Snouts from the CWT fish will be dissected at the WDFW Olympia office. Scale samples and CWTs will also be read in Olympia. This is standard procedure for all Columbia River samples collected by WDFW.

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

If surplus exceeds 10% of program goal, Region staff would be contacted. Program surplus (>10%) is evaluated in context of production release permits/guidelines. Hatchery manager would implement fish release or other strategy based on direction/authorization per Complex Manager/Oversight Committee.

10.9 Fish health certification procedures applied pre-release.

Prior to release, the population health and condition is established by the Area Fish Health Specialist. This is commonly done 1-3 weeks pre-release and up to 6 weeks on systems with pathogen free water and little or no history of disease. Prior to this examine, whenever abnormal behavior or mortality is observed, staff also conducts the Area Fish Health Specialist. The fish specialist examines affected fish, and recommends the appropriate treatment. Reporting and control of selected fish pathogens are done in accordance with the Co-managers Fish Disease Control Policy and IHOT guidelines.

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

Grays River Hatchery-Catastrophic management against equipment failure, water loss, and flooding

Adult Holding: Prior to spawning, brood stock are held at the Grays River Hatchery in the concrete holding ponds. The holding ponds are supplied by gravity-fed Grays River water, if the water supply to the ponds was ruptured that event would be detected by an alarm system. If that occurred the hatchery staff has at least three rescue options. First, depending upon stream conditions, the pumps could be placed into Grays River until the water supply to the pond is restored. Second, the pumps could be placed in nearby raceways or to the earthen pond. Or, if none of those locations are suitable, the fish could be liberated into the river.

Spawning and Incubation to the fry stage: If a failure in the gravity pipeline disrupts the delivery to the units, two options exist. First, if none of the eggs have hatched, each Heath tray would be de-watered and the eggs can be kept moist for up to 24 hrs or longer, until replacement pumps can be installed or the line repaired. If that is not possible, well water from Auxiliary Creek can be used for incubation. If all water lines are ruptured, egg trays could be carried out to the rearing raceways or earthen pond and supplied with gently moving water at those locations

Rearing: If well water is available, the some of the fish could be converted to well water. If all water supplies are disrupted, fry can be maintained by supplying each raceway with air stones that are fed by cylinders of compressed air or depending upon conditions in the river and time of year the fish could be released into the Grays River.

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

- The production and release of smolts through fish culture and volitional release practices fosters rapid seaward migration with minimal time in the rivers, limiting interactions with naturally produced steelhead juveniles.
- Program is mass marked to achieve maximum harvest and removal of adults.
- This fish are released after a majority of chum emigration has taken place.
- WDFW has reduced the program release size (fpp) and program numbers produced at Grays River Hatchery from previous levels by 60%.
- WDFW proposes to continue monitoring, research and reporting of hatchery smolt migration performance behavior, and intra and interspecific interactions with wild fish to access, and adjust if necessary, hatchery production and release strategies to minimize effects on wild fish.
- WDFW fish health and operational concerns for Grays River Hatchery programs are communicated to Region 5 staff for any risk management or needed treatment. See also section 9.7.

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.

Refer to Section 1.10 for a discussion of how each “Performance Indicator” will be monitored and evaluated. Additional coho interaction work is being conducted on the Lewis River, which may have implications to the Elochoman River. The proportion of hatchery coho on the spawning grounds is now being monitored with the start of the Mass Making Program. The Cedar Creek (Lewis River) natural fish populations are now being monitored with both an upstream migrant trap installed (1998) in the Cedar Creek Fish Way and a downstream smolt migrant (screw) trap beginning in 1998. An attempt will be made to determine the interaction of naturally spawning hatchery coho with natural spawning coho. With the ultimate goal of determining if limit access of hatchery coho to the upper Cedar Creek watershed increase natural coho production. Secondly to evaluate whether a stream (coho stock) strongly impacted by the genetics of hatchery fish changes (spawn timing, etc.) over a short period of time with the exclusion of hatchery fish. Implement programs on other streams based on the data gather from the Cedar Creek evaluation. Ecological interactions between program fish and natural fish will be addressed through Cedar Creek monitoring and evaluation measures proposed and further investigations of coho smolt residuals (emigration rates and release sites) and fall chinook predation by hatchery coho smolts in the Lewis River.

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

To evaluate hatchery programs comprehensive monitoring and evaluation programs are needed. These programs at a minimum must measure adult hatchery and wild escapement, and fishery contributions from hatchery and wild salmonids for every stock. Reproductive success should be measured for representative wild and hatchery stocks. Ecological interactions (predation, competition, and disease) need to be measured for representative stocks as well. With the loss of Mitchell Act funding, staffing and logistical support may be lost to continue the monitoring and evaluation of this and other programs on the Columbia River. Current Fish program staff is available to complete baseline monitoring and evaluation needs while research is on-going for coho interaction in the Lewis River.

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

Monitoring, evaluation and research follow scientific protocols with adaptive management process if needed. WDFW will take risk aversion measures to eliminate or reduce ecological effects, injury, or mortality as a result of monitoring activities. Most trap mortalities are the result of extreme environmental conditions that flood traps, or equipment failure. WDFW will take precautions to make sure the equipment is properly functioning during the season. If environmental conditions are forecast that will cause high mortality then traps will be removed or opened up to allow unobstructed passage without mortality. Any take associated with monitoring activities is unknown but all follow scientific protocols designed to minimize impact.

Section 12. Research

12.1 Objective or purpose.

No research activities are directly conducted for this program.

12.2 Cooperating and funding agencies.

12.3 Principle investigator or project supervisor and staff.

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

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

12.6 Dates or time periods in which research activity occurs.

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

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

12.9 Level of take of listed fish: number 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).

12.10 Alternative methods to achieve project objects.

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

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

Section 13. Attachments and Citations

13.1 Attachments and Citations

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14.) Harza. 1999. The 1997 and 1998 technical study reports, Cowlitz River Hydroelectric Project. Vol. 2, 35-42.

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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:_____

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

Fall Chinook

ESU/Population	Lower Columbia River Chinook
Activity	Grays River Hatchery Type S Coho Program
Location of hatchery activity	Grays River Hatchery
Dates of activity	September – November
Hatchery Program Operator	WDFW

Type of Take	Annual Take of Listed Fish by life Stage (number of fish)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass (a)	nya	nya	nya	nya
Collect for transport (b)	nya	nya	nya	nya
Capture, handle, and release (c)	nya	nya	0*	nya
Capture, handle, tag/mark/tissue sample, and release (d)	nya	nya	nya	nya
Removal (e.g., broodstock (e)	nya	nya	nya	nya
Intentional lethal take (f)	nya	nya	nya	nya
Unintentional lethal take (g)	nya	nya	0	nya
Other take (specify) (h)	nya	nya	nya	nya

0* Any Chinook volitionall entering the holding ponds are released back ot stream. No observed mortalities have been reported by staff.

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.

b. Take associated with weir or trapping operations where listed fish are captured and transported for release.

c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.

d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.

e. Listed fish removed from the wild and collected for use as broodstock.

f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.

g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.

h. Other takes not identified above as a category

Take Table 2. Estimated listed salmonid take levels by hatchery activity.

Chum

ESU/Population	Lower Columbia River Chum
Activity	Grays River Hatchery Type S Coho Program
Location of hatchery activity	Grays River Hatchery
Dates of activity	September – November
Hatchery Program Operator	WDFW

Type of Take	Annual Take of Listed Fish by life Stage (number of fish)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass (a)	nya	nya	nya	nya
Collect for transport (b)	nya	nya	nya	nya
Capture, handle, and release (c)	nya	nya	0*	nya
Capture, handle, tag/mark/tissue sample, and release (d)	nya	nya	nya	nya
Removal (e.g., broodstock (e)	nya	nya	nya	nya
Intentional lethal take (f)	nya	nya	nya	nya
Unintentional lethal take (g)	nya	nya	0	nya
Other take (specify) (h)	nya	nya	nya	nya

0* Chum are not seen volitionally entering the holding pond. No observed mortalities have been reported by staff.

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.

b. Take associated with weir or trapping operations where listed fish are captured and transported for release.

c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.

d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.

e. Listed fish removed from the wild and collected for use as broodstock.

f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.

g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.

h. Other takes not identified above as a category.

Take Table 3. Estimated listed salmonid take levels by hatchery activity.

Coho

ESU/Population	Lower Columbia River Coho
Activity	Grays River Hatchery Type S Coho Program
Location of hatchery activity	Grays River Hatchery
Dates of activity	September – May (eighteen months)
Hatchery Program Operator	WDFW

Type of Take	Annual Take of Listed Fish by life Stage (number of fish)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass (a)	nya	nya	nya	nya
Collect for transport (b)	nya	nya	nya	nya
Capture, handle, and release (c)	nya	nya		nya
Capture, handle, tag/mark/tissue sample, and release (d)	nya	nya	nya	nya
Removal (e.g., broodstock (e)	nya	nya	Up to 700 adults	nya
Intentional lethal take (f)	nya	nya	Up to 700 adults	nya
Unintentional lethal take (g)	16,875*	16,875*	nya	nya
Other take (specify) (h)	nya	nya	nya	nya

* Based on 90% egg to fry survival and 90% fry to smolt survival.

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