HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	Elochoman River Type S Coho Program
Species or Hatchery Stock	*Oncorhynchus kisutch* Coho Salmon
Agency/Operator	Washington Department of Fish & Wildlife
Watershed and Region	Elochoman 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.

Elochoman River Type S Coho Program

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

Coho Salmon (Oncorhynchus kisutch)

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

1.3 Responsible organization and individuals.

Name (and title):	Aaron Roberts
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program.

Co-operators	Role
National Marine Fisheries Service	Program Funding Source/Administrator (Mitchell Act)

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

Funding Sources
Mitchell Act

Operational Information	Number
Full time equivalent staff	4.5
Annual operating cost (dollars)	380000

The above information for full-time equivalent staff and annual operating cost applies cumulatively to Elochoman River Anadromous Fish Programs and cannot be broken out specifically by program.

1.5 Location(s) of hatchery and associated facilities.

Broodstock source	Elochoman River Type S Coho Salmon
Broodstock collection location (stream, RKm, subbasin)	Elochoman River Hatchery/Elochoman River/RKm 11.3/Elochoman
Adult holding location (stream, RKm, subbasin)	Elochoman River Hatchery/Elochoman River/RKm 11.3/Elochoman
Spawning location (stream, RKm, subbasin)	Elochoman River Hatchery/Elochoman River/RKm 11.3/Elochoman
Incubation location (facility name, stream, RKm, subbasin)	Elochoman River Hatchery/Elochoman River/RKm 11.3/Elochoman
Rearing location (facility name, stream, RKm, subbasin)	Elochoman River Hatchery/Elochoman River/RKm 11.3/Elochoman

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 418,000 Type S coho yearlings into the Elochoman River.
- Produce coho salmon to help mitigate for fish losses, including commercial and sport harvest, in the Columbia river Basin for activities within the Columbia River Basin that have decreased salmonid populations including federal dams.

1.8 Justification for the program.

- Legal justification includes: Mitchell Act, Pacific Northwest Electric Power Planning and Conservation Act, and U.S. v Oregon court agreements.

- WDFW protects listed fish and provides harvest opportunity on Elochoman River coho 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, chum, and coho 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.

In order to minimize impact on listed fish by WDFW facilities operation and the Elochoman Type S coho program, the following Risk Aversion are included in this HGMP:

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

Potential Hazard	**HGMP Reference**	**Risk Aversion Measures**
Water Withdrawal	4.2	Water rights are formalized thru trust water right S2-23896 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 13-1008.
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 HGMP Section 1.10

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	Contribute to a meaningful harvest for sport, tribal and commercial fisheries. Achieve a 10-year average of 1.56% smolt-to-adult survival (range .01% - 8.04%) 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 Broodstock within broodstock (NOB)	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 (30,000/7%) for evaluation purposes	Returning fish are sampled throughout their return for length, sex, mark and
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/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/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/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 (17.0 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 Expected size of the Program

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

WDFW has established an egg take goal of 548,000 eggs (2004 FBD). To meet this goal a total of 185 females and 185 males need to be collected annually excluding jacks, based on an average fecundity of 3000 eggs/female and pre-spawning mortality of 10%. A pre-season meeting between Hatchery and Fish programs will occur in June/July to review past hatchery operations, natural escapement, and develop a plan for weir and hatchery operations during the upcoming fall season. Since run size predictions are not always accurate and run timing varies annually, programs must maintain flexibility to meet our goals of ensuring natural and hatchery numerical escapement objectives as well as selection for run timing, spawning time, and size.

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

418,000 yearling smolts are released from the Elochoman River hatchery located at RKm. 11.3.

Age Class	Max. No.	Size (ffp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Water-shed	Eco-province
Yearling	418,000 FBD	17.0	April	Elochoman	11.3	Elochoman	Lower Columbia

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

Data below combines both Elochoman Type N and Type S Coho programs and are not broken down separately (See also Elochoman Type S HGMP). Total production from both programs is 955,000.

Brood Year	SAR	Total Catch	Escapement (BY)
1988	8.04%	14,401	N/A
1989	0.20%	814	N/A
1990	0.48%	1953	N/A
1991	0.03%	54	N/A
1992	0.16%	290	N/A
1993	0.06%	250	N/A
1994	0.01%	330	N/A
1995	0.36%	880	N/A
1996	2.01%	7207	1,325
1997	3.22%	12,231	781
1998	1.38%	8070	3,323
1999	N/A	N/A	6,389
2000	N/A	N/A	15,560
2001	N/A	N/A	19,900
2002	N/A	N/A	13,061
2003	N/A	N/A	N/A
Avg.	1.56%	4,225	8,620

Ruggerone Report (Natural Resource Consultants- WDFW report), annual hatchery escapement, catch record card report. BPA SAR (hatchery only) Annual Coded-Wire Tag Program, Washington Missing Production Groups, Annual Report 2000

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

The first year of operation for this hatchery was 1954.

1.14 Expected duration of program.

The program is on going with no planned termination.

1.15 Watersheds targeted by program.

Elochoman 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

Type S coho are collected at Elochoman Hatchery and the smolts are released at the station. The current policy is to release all unclipped coho to spawn naturally. Type S and Type N coho can be kept separate with respect to run timing, but some overlap may occur during transition. The barrier at Elochoman Hatchery is in need of repair and cannot stop all coho, especially in high water.

1.16.2 Potential Alternatives to the Current Program

Alternative 1: Merge Type S and Type N coho. Merging the runs can be accomplished by collecting broodstock over one broad run time.

Alternative 2. Move toward an integrated population. Use some unmarked coho in the hatchery and allow some clipped hatchery fish to spawn naturally. This alternative would require monitoring and evaluation to determine the impacts of this strategy, particularly needed is an estimate of the wild coho population in the Elochoman River.

1.16.3 Potential Reforms and Investments:

Reform/Investment 1: The barrier at Elochoman is not compliant with current passage standards, and the dam itself has failed in the midstream section. At this time a temporary repair has been made to this structure and we have also discovered a significant failure under the wing wall on the hatchery side of the barrier, which is the anchor for the fish passage ladder $$$.

Added to the barrier and fish ladder problems the need for all three intakes to be re-built to comply with current screen size, sweep velocity, and passage criteria and the need for capitol is daunting under current budget allotments $$$$.

Reform/Investment 2: The adult trap and holding pond facility at Elochoman has several issues related to unsafe handling of adult listed fish. A complete investigation and comprehensive re-design is needed to accommodate a new facility that can trap, sort, return to the stream, and or load fish with a water to water transfer method to cause no harm to hatchery or wild stocks. Adult sorting and handling in general is very hard on adult fish and routinely causes mortality that can be prevented with a modern sorting and handling system designed to cause the least harm possible to all fish handled. A semi-automated sorting system would be comprised of the following: An initial holding pond would collect and hold the fish until sorting is initiated by opening a gate, which allows adults to be attracted through a false weir and onto a fabricated, sloped, sorting chute. The chute contains paddles and side chutes. The side chutes lead to different adult ponds, and also provide returns to the river above and below the in stream barrier. An observer located in a control tower above the main chute identifies the fish as it enters the chute and then activities in of the paddles to direct the fish to the desired location. Staff does not physically handle the fish during this sorting process $$$.

Reform/Investment 3: Monitoring and evaluation will be needed to estimate the wild portion of the population, measure productivity, interactions between hatchery and wild, and insure survival of the wild coho $$.

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	L	H	M
Short-term Goal	M	H	M
Long-term Goal	H	H	H

Section 2: Program Effects on ESA-Listed Salmonid Populations

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

Program is described in the "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; by 2004 WDFW is writing HGMP's to cover all programs produced from and released at Elochoman 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	H	M
Chum- Natural	L	L
Coho – Proposed Hatchery and Natural	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 on June 14, 2004.

Identify the ESA-listed population(s) that may be incidentally affected by the program.
Lower Columbia River fall chinook salmon *(Oncorhynchus tshawytscha*) are federally listed as "threatened" under the Endangered Species Act.
Columbia River chum salmon *(Oncorhynchus keta*) - 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.

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

Lower Columbia River Coho (*Oncorhynchus kisutch*) is currently a candidate for listing but has been proposed as threatened on 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). Elochoman 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 Elochoman River and its tributaries; 371 coho documented in Elochoman River; coho designated as 'observed' in Skamokawa. In 1951 WDFW estimated an annual escapement of 2500 late coho to the

Elochoman River and 2,000 late coho to Skamakowa Creek. Hatchery production accounts for most coho returning to Elochoman River. Natural coho production is presumed to be very low. Smolt density model estimated Elochoman basin production potential of 43,393 smolts. (LCFRB Elochoman Subbasin Report, Volume 11, Chapter 5). In the past five years, returns to the rack of hatchery adults have ranged from 583 (1998) to 7,349 (2001). A majority of these fish are released upstream along with wild coho. Wild coho numbers have ranged from 36 fish in 2001 to 216 in 2000.

Lower Columbia River fall chinook salmon *(Oncorhynchus tshawytscha*) within the Evolutionary Significant Unit (ESU) are federally listed as "threatened" under the Endangered Species Act effective May 24, 1999.

Status: In Washington, the LCR chinook ESU includes all naturally spawned chinook populations from the mouth of the Columbia River to the Cascade Crest. In 1950, estimated annual escapement of fall chinook in the Elochoman River was 2,000 fish (WDF 1951). Today, the most heavily spawned area is in the main river above tidewater. A weir just above tidewater is used to collect fall chinook for the hatchery. When the hatchery has reached its egg-take goal, the remaining fish are allowed to proceed into the watershed and spawn naturally. On favorable flows they could go as high as the dam at the hatchery at RM 9.2 and fall chinook can spawn naturally from RM 3 to RM 11.3. Access above the Elochoman Hatchery is limited by the intake weir. Entry of adults into the subbasin occurs from early September to November. Natural escapement estimates for the Elochoman River has averaged 636 fish during 1987 through 2000. Spawning occurs from late September to mid-November with a peak usually in mid-October. Mark sampling on the spawning grounds indicates natural spawners are largely hatchery origin. SaSI (2002) considers this population to be heavily hatchery origin and lists it as healthy.

There is no information relating to survival rates for naturally produced fall chinook, but the survival to fisheries of Elochoman Hatchery fall chinook ranged from 0.06% to 0.9% (Byrne et al., 1997). Information is limited, but utilizing tag recoveries from the Washington Missing Production Groups Program, it was estimated that in 1996 the natural production was 65% and in 1997 it was 11%.

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

Columbia River chum salmon *(Oncorhynchus keta*) Mainstem Chum within the lower

Columbia River Evolutionary Significant Unit (ESU) are federally listed as threatened effective May 24, 1999).

Status: Historically, chum salmon were abundant in lower portions of the Columbia River and supported annual harvests of hundreds of thousands of fish. Chum salmon are native to the Elochoman River. Although natural production is much reduced over historic levels, a small remnant run still returns to spawn. Washington Department of Fisheries reports for the Lower Columbia River Fishery Development Program in 1951 estimated chum escapement in the Elochoman River to be about 1,000 fish, spawning mainly in the lower reaches of the main river above tidal influence. This was in the period when Columbia River chum stocks declined precipitously. In 1973, the Washington Department of Fisheries reported a small run to the river.

Directed spawning ground surveys are not conducted in the Elochoman River for chum and no estimates are available on current run size or biological characteristics of the stock. Similar data for Grays River chum should be applicable. 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. A few fish return as 5-year-olds, but none as 2-year-old jacks. Males predominate in the 5-year-old class.

Recent stream enhancement work by the Washington Department of Fisheries in the Grays River watershed at Gorley Springs has been relatively successful and may increase basin chum production by providing a stable incubation environment. The same kind of project could support rebuilding the Elochoman River chum stock. It is expected that suitable sites are available for such projects.

Occasional releases of chum fry have been made in the basin. Egg-box programs in 1978, 1979 and 1980 released 50,000, 376,000 and 475,000 fry (Hood Canal stock), respectively. The present low numbers of chum in the Columbia River made it necessary to use stock from outside the area. No spawning ground surveys were conducted in subsequent years to determine the success of these releases. The Elochoman River Salmon Hatchery does not raise chum and planners anticipate that any future supplementation of the run would be through the use of portable egg incubators and direct release of emergent fry or short-term rearing (up to one month) in portable raceways and on-site release of the fed fry.

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 identified as 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 Elochoman system in late August thru September. A temporary weir at tidewater (Foster Road at RKm 3.0) blocks chinook from traveling upstream of this point but picket gaps (4.5 inches) allow other salmonid species migration and smolt movement downstream thru this structure. Coho arrive at the Elochoman Hatchery (RKm 11.3) in mid-September and can continue thru October when the lower river is removed. Coho are diverted into a ladder that leads to the adult collection pond. Any wild chinook, steelhead and coho that enter the pond during this time are monitored and released upstream of this point. Region 5 fish program staff plans upcoming adult handling in a preseason meeting with hatchery staff and there is staff communication to best handle unforeseen or weather related events that can impact runs and procedures. See Table 1 for direct take.

Genetic introgression: Both early and late coho stocks are probably represented on the spawning grounds in the Elochoman River today. All adults recruited for use as broodstock have been of hatchery origin since 1998. Native populations of coho were present in all lower Columbia River tributaries historically. Under the Columbia River Development program in the 1950s, salmon hatchery construction was expanded on the lower Columbia River tributaries, and hatcheries began to trap brood stock in many areas. Elochoman River natural spawners are hybrids between native coho and non-native hatchery coho. Mixing of stocks very likely began to occur with the first releases. There are no known genotypic, phenotypic, or behavioral differences between either the hatchery stock or natural stock in the subbasin. For 2004, staff will integrate natural spawners into the broodstock and will limit out of basin transfers except in rare circumstances. Indirect take from genetic introgression is unknown.

Rearing Program:

Operation of Hatchery Facilities: Elochoman Hatchery withdraws water from the river at two locations; one is at the hatchery intake while another intake is situated 0.4 miles upstream During low flows during late summer and early fall, the area from the upper intake location and where the non-consumptive water rejoins the river is a distance of approximately 0.5 miles (Mitchell Act Hatcheries Intake and Fish Passage Study report April (2003) and loss of water creates minimal flows in that stretch. Water withdrawal is permitted, intake and screening compliance has been assessed and solutions identified. Hatchery effluent discharges fall within NPDES (Clean Water Act) 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 Elochoman Hatchery. Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1994) chapter 5 have been instrumental in reducing disease outbreaks. Indirect take from disease are unknown.

Release:

Hatchery Production/Density-Dependent Effects: Hatcheries can release numbers of fish that can exceed the density of the natural productivity in a limited area for a short period of time and can compete with listed fish. Elochoman Type S coho releases since 1998 have been reduced almost

25% from the average releases (554,000) from 1993-1997 to the current level (418,000) and are mass marked to provide intensive select fisheries. Coho releases are scheduled to start mid-April but environmental conditions or unforeseen problems could occur and require region staff to adjust the program as needed for the safety of the program. Releases are as active smolts that have a high probability of migrating soon after release. 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." On station release in large systems may travel even more 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 systems 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 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. Elochoman streamflow originates almost entirely from the rainfall in the region. Average streamflow over a 31-year period (1940-1971) was 375 cubic feet per second (cfs) with wide extremes between a maximum flow of 8,530 cfs in November 1962 to a minimum of 9.8 cfs in August 1967. (Gauge records after 1971 are not continuous and the U.S. Geological Survey gauge station was discontinued in 1977.). In 1977 measured flow ranged from 19 cfs to 1,060 cfs for the year. From April 1, flows averaging approximately 600 cfs are reducing significantly to less than 200 cfs by mid May (adapted form Wade 2002 Elochoman River Subbasin Planning).

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 (cite source). Chum are present in the mainstem Columbia from the Grays River and Sea Resources chum restoration programs. Proposed listed coho are present in the system. Current releases are in April, but staff is reviewing changes needed to implement a May release period.

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” is valid 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 involves co-mingling. 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. The Elochoman coho programs have been acclimated in the rearing ponds and are released as active smolts. Combined with a volitional release during the first phase of release, the goal is to have the program migrate quickly.

We have provided in this section a summary of empirical information a theoretical analysis of competition and predation interactions that may be relevant to the Elochoman

Hatchery coho program.

Potential Elochoman Type S coho predation and competition effects on listed salmonids: The proposed annual production goal for this program is 418,000 fish. Elochoman coho programs start volitional releases in early to mid-April. This window of release of Elochoman coho (April) could encounter listed fish (emerging Chinook and chum) in the Elochoman subbasin and Columbia mainstem. Elochoman coho will be now targeted for release at 17 fpp (131 mm fl) where in the past releases sizes sometimes reached 12 -13 fpp (146 –143 mm fl). Due to size differences between coho smolts and fingerling listed stocks (Chinook and chum), competition is probably low. At 17 fpp, potential predation on listed chinook would be on fish of 43-44 mm fl and smaller.

Relative Body Size: Below are some data available for chinook fry and fingerling lengths from area Lower Columbia streams. The current release poses a risk to listed Chinook of less than 44-45 mm fl although as mentioned previously, the magnitude of predation will depend upon the characteristic of the listed population of salmonids and the habitat in which the population occurs. 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 length by week from 26 sampling sites on the Kalama River by week 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 2).

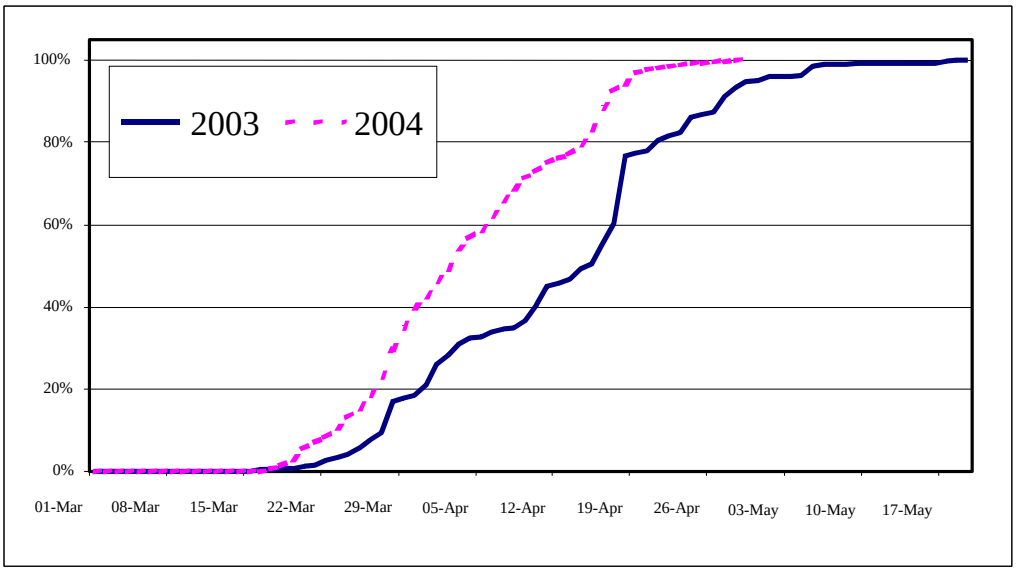

Figure 1. Chum salmon out migration timing at Duncan Creek for Brood Year 2002 & 2003.

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 residualism 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 co-efficient of variation (CV) are measured through out the rearing cycle and at release.
- Feeding rates and regimes through out the rearing cycle are programmed to satiation feeding to minimize out of size fish and programmed for smolt phase as release or plant times approach.
- Based on past history, fish have reached a size and condition that indicates a smolted condition at release.
- Releases occur within known time periods of species emigration from acclimated ponds.
- Releases from these ponds are volitional with large proportions of the populations moving out initially with the remainder of the population vacating with in a couple of days.
- Minimal residualism from WDFW coho programs following these guidelines has been indicated from snorkeling studies on the Elochoman River (Fuss 2000).

Migration Corridor/Ocean: It is unknown to what extent listed fish are available both behaviorally or spatially on the migration corridor. Once in the main stem, Witty et al. (1995) has concluded that predation by hatchery production on wild salmonids does not significantly impact naturally produced fish survival in the Columbia River migration corridor. Evidence in estuarine and nearshore environments indicate that diets are often dominated by invertebrates with Durkin (1982) reporting that diet of coho smolts (128-138 mm fl) in the Columbia River estuary was composed almost entirely of invertebrates without evidence of salmonids as prey (HSRG - Hatchery Reform 2004). There appear to be no studies demonstrating that large numbers of Columbia system smolts emigrating to the ocean affect the survival rates of juveniles in the ocean in part because of the dynamics of fish rearing conditions in the ocean. Indirect take in the migration corridor or ocean 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, 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).

See take table at the end of the HGMP.

Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

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.

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.

For ESU-wide hatchery plans, the production of coho salmon from Elochoman Hatchery is consistent with:

- 1999 Biological Opinion on Artificial Propagation in the Columbia River Basin
- 1999 Review of Artificial Production of Anadromous and Resident Fish in the Columbia River Basin
- Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1994)
- The *U.S. v. Oregon* Columbia River Fish Management Plan
- NWPPC Fish and Wildlife Program

For statewide hatchery plan and policies, 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 with which the production of coho salmon from Elochoman River Hatchery is consistent with the following WDFW Policies*:*

Genetic Manual and Guidelines for Pacific Salmon Hatcheries in Washington. These guidelines define practices that promote maintenance of genetic variability in propagated salmon.. 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.. 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* (Fish 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:

- The Columbia River Fish Management Plan (CRFMP)
- 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 (WDFW) Wild Salmonid Policy
- WDFW's Yearly Future Brood Document (FBD)
- Lower Columbia Fisheries Management and Evaluation Plan (2002 FMEP)

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.

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

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. They are generally recognized as Toutle River origin fish. The late-returning coho are referred to as north-turning or N-type fish because they contribute more heavily to the northern ocean fisheries. They are generally recognized as Cowlitz origin hatchery fish. Hatchery Coho can contribute significantly to the lower Columbia River gill net fishery; commercial harvest of early coho in September is constrained by fall chinook and Sandy River coho management; commercial harvest of late coho is focused in October during the peak abundance of hatchery late coho. Since 1999, hatchery coho are adipose-fin marked to allow quick identification of these hatchery fish intended for harvest while the presence of the adipose fin also allows for quick identification of wild stocks. During 1999-2002, fisheries harvest of ESA listed coho was less than 15% each year.

With mass marking the agency staff has taken steps to identify natural coho stocks and handle them in a manner that would provide for their survival and reproduction yet maximizing harvest thus limiting hatchery coho on the spawning grounds. Harvest rates for Columbia River coho have averaged 74.2% in the mid 1980s (1985-89). The harvest rates for the recent two years have averaged 48.8% (1997-98). Fishery CWT recoveries of 1995-97 brood Elochoman early coho were distributed between Columbia River (53%), Washington ocean (40%), and Oregon ocean (7%) sampling areas. Natural 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. Until recent years, natural 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.

Brood Year	SAR	Total Catch	Escapement (BY)
1988	8.04%	14,401	N/A
1989	0.20%	814	N/A
1990	0.48%	1953	N/A
1991	0.03%	54	N/A
1992	0.16%	290	N/A
1993	0.06%	250	N/A
1994	0.01%	330	N/A
1995	0.36%	880	N/A
1996	2.01%	7207	1,325
1997	3.22%	12,231	781
1998	1.38%	8070	3,323
1999	N/A	N/A	6,389
2000	N/A	N/A	15,560
2001	N/A	N/A	19,900
2002	N/A	N/A	13,061
2003	N/A	N/A	N/A
Avg.	1.56%	4,225	8,620

Ruggerone Report (Natural Resource Consultants- WDFW report), annual hatchery escapement, catch record card report. BPA SAR (hatchery only) Annual Coded-Wire Tag Program, Washington Missing Production Groups, Annual Report 2000

3.4 Relationship to habitat protection and recovery strategies.

Subbasin Planning and Salmon Recovery:

The current Elochoman HGMP processes are designed to deal with existing hatchery programs and potential reforms to those programs. A regional sub-basin planning process (Draft Elochoman River Subbasin Summary May 17, 2002 and May 2004) 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, 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 Elochoman Complex.

Habitat Treatment and Protection

WDFW is presently conducting or has conducted habitat inventories within the Elochoman 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.

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 Elochoman 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 Elochoman steelhead program and are taken from the Puget Sound listed and non-listed HGMP template (WDFW and NOAA 2003).

(1) Salmonid and non-salmonid fishes or species that could negatively impact the program: Elochoman coho smolts can be preyed upon release 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 (river otters), and returning adults include: harbor seals, sea lions 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 fall chinook, Type N coho and steelhead programs are released in the Elochoman system and limited 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). Addition of nutrients has been observed to increase

the production of salmonids (Slaney and Ward 1993; Slaney et al. 2003; Ward et al. 2003). The Elochoman River drainage is thought to be inadequately seeded with anadromous fish carcasses and steelhead carcasses can be used throughout the basin. Assuming integrated spawning and carcass seeding efforts, approximately 5,000 – 10,000 Type S coho adult carcasses could contribute approximately 25,000 – 50,000 pounds of marine derived nutrients to organisms in the Elochoman river.

4) Salmonid and non-salmonid fishes or species that could be positively impacted by the program. Elochoman coho smolts can be preyed upon release thru the entire migration corridor from the river subbasin to the mainstem Columbia River and estuary. 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 (river otters), and returning adults include: harbor seals, sea lions 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 is supplied from four sources: Clear Creek, small A-Stream, and two large gravity intakes on the Elochoman River. A single river pump is located downstream of the hatchery bridge and used in case of emergency. Clear Creek and A-Stream are used primarily for pathogen free hatchery incubation and rearing although some adult salmon have been observed upstream of the Clear Creek intake. If needed reuse from the raceways can be used during heavy loading periods. During summer, water from the river intake reflects elevated temperatures.

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 5000 gpm from October to June. During July, August and September withdrawal is about 4000 gpm. Four sources: Elochoman River, Clear Creek, and A-Stream are under DOE water permit S2-23896. A-Stream is spring fed and determined to be non-fish bearing streams therefore of no impact. Monitoring and measurement of water usage is reported in monthly NPDES reports (see below).
Intake/Screening Compliance	Intake structures were designed and constructed to specifications at the time the Washougal facility was constructed. The Mitchell Act Intake and Screening Assessment (2002) has identified design and alternatives needed to get existing structures in compliant including Washougal Hatchery. Intake screens (3/32 inch wide x 11/4 inch long) and velocity sweeps may not be compliant with NOAA fish screening standards. Allowable velocity of 0.40 fps is exceeded and the backup pump is too close the screen area causing high approach velocity. From the assessment, WDFW has been requesting funding for future scoping, design, and construction work of a new intake system.
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 13-1008. 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).

Adult coho arrive at the Elochoman hatchery starting in early October. Even though the lower river weir can still be in place, the picket widths are wide enough to allow early coho to pass thru the weir during early September and continue upriver when they show up. The barrier weir at the hatchery diverts fish to a ladder that enters pond number 21. Fish are seined weekly for sorting, testing for ripeness; the spawning bin area is located at the head end of the pond.

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

Adult coho are not transported for broodstock from the downstream weir.

5.3 Broodstock holding and spawning facilities.

Coho held for spawning are maintained in the earthen pond. The pond is supplied with 4000 gallons per minute (gpm) of fresh water. Integrated Hatchery Operations Team (IHOT) adult holding guidelines are followed for adult holding, density, water quality and alarm systems. Adults are seined, sorted, killed and spawned directly from the adult holding pond. Fish not ready to spawn are returned to the pond for further maturation. Spawning for this program takes place in a covered area.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
1	Earthen Pond (Adult Holding)	22400	70	80	4.0	4000

5.4 Incubation facilities.

The hatchery building contains 60 double stacks of FAL vertical-flow incubators and 18 free style incubators for the bulk eyeing of eggs, 2 deep trough incubators and 6 shallow troughs. Water source is from Clear Creek. Standard 1:6000 (1667ppm) formalin drip treatments controls fungus on eggs and are administered 15 minutes 6 times weekly.

5.5 Rearing facilities.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Flow Index	Max. Density Index
10	Standard Concrete Raceways	3600	90	20	2.0	300	nya	0.30
1	Asphalt Pond (Adult Holding or Fish Acclimation Unit)	49400	213	52	4.5	5000	nya	0.3

5.6 Acclimation/release facilities.

The acclimation and release facilities are the same as the rearing facility. See above.

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. Botulism loss has been severe in past years but current outbreaks in mid-August have been treated with Terramycin (4% for 14 days) with good results.

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 through 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. Importing eggs from other facilities is occasionally done when insufficient numbers of eggs are available. Eggs from adults returning to the hatchery are always given priority for on-station use. Program broodstock is collected from hatchery-origin (adipose fin missing).

6.2.1 History.

Today, hatchery stocks are generally referred to as early (Type S) and late (Type N). Type-S coho are distributed in a more southerly ocean area, and contribute to coastal Oregon fisheries more than their northerly-distributed Type-N cohorts. . Both stocks are probably represented on the spawning grounds in the Elochoman River today. There are no known genotypic, phenotypic, or behavioral differences between either the hatchery stock or natural stock in the subbasin. Since 1999, all S coho eggs have come from broodstock returning to the hatchery.

Broodstock Source	Origin	Year(s) Used	
		Begin	End
N.F. Toutle River Type S Coho	H	U	1998
Elochoman River Type S Coho	N	U	1997
Elochoman River Type S Coho	H	U	Present
Grays River Type S Coho	H	1996	1996
Kalama River Type S Coho	H	1998	1999
Lewis River Type S Coho	H	1992	1992

6.2.2 Annual size.

A total of up to 370 broodstock at 1:1 ratio (185 females and 185 males) and up to 8 jacks will be collected.

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

Since 1995 brood year, all "Type S" coho have been mass marked. . In 2002, 3,105 males and 3090 females of hatchery origin were released upstream of the hatchery. In 2002, 63 males and 38 wild female coho were released from the holding ponds. In 2004, WDFW is proposing to maximize the number of natural origin fish into the broodstock.

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 past years where insufficient numbers of adults return, eggs may be obtained from the Toutle River Type-S hatchery coho if available. With the proposed integrated program, staff will limit out of basin transfers except in rare circumstances.

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. 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 stock provides the fresh water commercial fishers and opportunity (timing) outside the peak fall chinook returns in the lower Columbia River.

Type-S coho provide more fishing opportunity. The early stocks are the strength of 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. Combined with later returning stock(s), they provide a extended period of quality catch in both the freshwater recreational and commercial fisheries.

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).

Year	Adults			Eggs	Juveniles
	Females	Males	Jacks		
Planned	200	200	4	nya	nya
1995	187	160	22	nya	nya
1996	145	206	nya	nya	nya
1997	147	80	nya	nya	nya
1998	nya	Nya	nya	nya	nya
1999	204	207	nya	nya	nya
2000	231	236	nya	nya	nya
2001	167	167	nya	nya	nya
2002	Na	Na			
2003	Na	Na			

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. Only AD clipped fish are retained for broodstock.

Proposed Integration – Starting with 2004 brood, WDFW will be maximizing natural coho into the broodstock program from cohorts represents the timing and distribution of natural Type S coho to the rack. Since 1997, a range of 10 –535 natural fish have been released upstream of the hatchery yearly.

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. Currently, up to 2004 all spawned broodstock have been Ad clip.

7.4 Proposed number to be collected:

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

167 spawning cohorts.

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

Year	Adults			Eggs	Juveniles
	Females	Males	Jacks		
Planned	200	200	4	nya	nya
1995	187	160	22	nya	nya
1996	145	206	nya	nya	nya
1997	147	80	nya	nya	nya
1998	nya	nya	nya	nya	nya
1999	204	207	nya	nya	nya
2000	231	236	nya	nya	nya
2001	167	167	nya	nya	nya

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

In 2002, 3,105 males and 3,090 females of hatchery origin were released upstream of the hatchery after broodstock and carcass enhancement needs are met.

7.6 Fish transportation and holding methods.

Coho broodstock do not need to be transported.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
1	Asphalt Pond (Adult Holding or Fish Acclimation Unit)	49400	213	52	4.5	5000
1	Earthen Pond (Adult Holding)	22400	70	80	4.0	4000

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.

Carcasses can be used for nutrient enhancement. After this, fish can be sold on contract or donated.

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.

- Limit out of basin transfers except in rare circumstances.
- Coho will be collected through out the run time from adults arriving at the hatchery rack.
- Additional natural coho are presumed to spawn downstream of the hatchery.
- Broodstock collection and sorting procedures can quickly identify non-target listed fish if encountered. Fish not used in the program are released immediately.

Section 8. Mating

8.1 Selection method.

Type-S coho pass through the lower Columbia in mid-August, entering tributary streams in September and spawning into late November. Elochoman spawning is conducted weekly, and occurs over a period of up to six weeks with the peak in late October. Spawning activity peaks between October 20 and November 1. Since run size predictions are not always accurate and run timing varies annually, programs must maintain flexibility to meet our goals of ensuring natural and hatchery numerical escapement objectives as well as selection for run timing, spawning time, and size.

8.2 Males.

The spawning protocol is described in the IHOT 1995 Volume III as follows; The intent is to use a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks. When spawning more than one million eggs in a day, the ratio will not be less than 1 male to 3 females. Jacks are incorporated into spawning protocol at approximately 1.0% (1:100 ratio).

8.3 Fertilization.

Disinfection procedures that prevent pathogen transmission between stocks of fish are implemented during spawning. Spawning implements are rinsed with an iodophor solution, and spawning area and implements are disinfected with iodophor solution at the days end of spawning. Fertilization occurs at a 1:1 ratio (females/males). Milt is mixed with green eggs with the ovarian fluid. Water hardening procedures with iodophor are followed after twenty minutes. Iodophor solution is used as rinse that is applied to hands and spawning implements per spawning. Iodophor footbaths are located at entrance to incubation room.

Fish health procedures used for disease prevention include water hardening of eggs in an iodophor at spawning and biological sampling of spawners. Generally, sixty ovarian fluid and kidney/spleen samples are collected from female spawners to test for the presence of viral pathogens.

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.

- Limit out of basin transfers except in rare circumstances.
- Mating cohorts are randomly selected.
- 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).

Section 9. Incubation and Rearing.

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

A total of 548,000 eggs is the take goal (2003 BRD). Acceptable S type stocks in case of shortage, may come from Kalama Falls, Grays River or North Toutle.

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 (%)
1995	626000	nya	nya	nya	91.6	nya	98.1
1996	345200	nya	nya	nya	93.3	nya	98.4
1997	352300	nya	98.8	nya	92.7	nya	98.1
1998	nya	nya	nya	nya	nya	nya	nya
1999	643000	91.8	nya	nya	93.9	nya	98.2
2000	626000	96.35	nya	nya	94.2	nya	98.2
2001	865000	96.2	nya	nya	91.3	nya	98.1

9.1.2 Cause for, and disposition of surplus egg takes.

Also for lower Columbia River stations, egg takes can be heavy loaded 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 staff at a landfill.

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 is from Clear Creek and 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 TU's) 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.

No listed fish are incubated.

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

Year	Egg Take	Green-Eyed Survival (%)	Eyed-Ponding Survival (%)	Egg Survival Perfor-mance Std.	Fry-fingerling Survival (%)	Rearing Survival Perfor-mance Std.	Fingerling-Smolt Survival (%)
1995	626000	nya	nya	nya	91.6	nya	98.1
1996	345200	nya	nya	nya	93.3	nya	98.4
1997	352300	nya	98.8	nya	92.7	nya	98.1
1998	nya	nya	nya	nya	nya	nya	nya
1999	643000	91.8	nya	nya	93.9	nya	98.2
2000	626000	96.35	nya	nya	94.2	nya	98.2
2001	865000	96.2	nya	nya	91.3	nya	98.1

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

General guidelines for density and loading targets are recommended by Piper et al. 1982. Individual hatchery programs will take water quality, flow profiles, and past performance into consideration for this program through the rearing period and the units they are reared in. In all facilities within Elochoman 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 a combination of river and spring water. Fish are moved from standard ponds in the fall to the asphalt pond (23) in combination with the Type N coho program for final rearing and release. Temperature, dissolved oxygen and pond turn over rate 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 although 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
March	nya	1100	nya	nya	nya	nya
April	nya	700	nya	0.364	nya	nya
May	nya	250	nya	0.500	nya	nya
June	nya	120	nya	0.520	nya	nya
July	nya	100	nya	0.167	nya	nya
August	nya	80	nya	0.200	nya	nya
September	nya	60	nya	0.250	nya	nya
November	nya	40	nya	0.333	nya	nya
December	nya	35	nya	0.125	nya	nya
January	nya	30	nya	0.143	nya	nya
February	nya	25	nya	0.167	nya	nya
March	nya	20	nya	0.200	nya	nya

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

Initial feeding and early rearing occurs in the incubation troughs. Ponding / feeding begins on a volitional basis when the fry are 100% at the swim-up stage. At this point very little, if any, yolk sack will be present. 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 TU's) 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 March. No energy reserve data is available.

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

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-April	Moore Clark Nutra Starter #0, 1, 2	7-5	3.0-2.0	nya	0.75:1.0
May-June	Moore Clark Nutra 1.2 mm	4-1	2.0	nya	0.85:1.0
June-August	Moore Clark Nutra 1.2 mm	1	1.0	nya	0.9:1.0
August-September	Moore Clark Nutra 1.5 mm	1	1.0	nya	1.0:1.0
September-April	Moore Clark Fry 2.0 mm	1	0.9-0.8	nya	1.1:1.0

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. Outbreaks of Botulism can occur in late summer and is treated with Terramycin. 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. Footbaths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

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

The migratory state of the release population is determined by fish behavior. Aggressive screen and intake crowding, swarming against sloped pond sides, a leaner (.80-.90) condition factor (K), a silvery physical appearance and loose scales during feeding events are signs of smolt development. Multiple smolt events can also be triggered by environmental cues including daylight increase, a spike in the water temperature and perceived spring freshets.

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

In 1995 WDFW conducted a study to increase pond complexity to see if it would improve survival of hatchery coho. A “natural density” and a “standard production” pond experiment was set up in spring 1996. Instead of 450,000 fish, only 30,000 fish were stocked into the test pond with gravel improvement, LWD and brush structures to simulate a natural pond environment. The control pond was stocked at 230,000 fish without natural rearing features as the test pond. Additionally, demand feeders were installed for the test pond while the control pond received regular staff feedings. The intent was to increase the number of test fish (to 100,000) and control fish (back to 700,000) the following year (1997-98). For smolt comparison, weekly measurements of gill Na+-K+ATPase, plasma sodium and cortisol, fish length, weight, condition factor and smolt status. To assess survival from smolt to adult, 30,000 fish were coded wire tagged in each group. Snorkel observations were made periodically to compare fish behavior between each pond. For the first group (1996), fish were released in spring of 1997. Outlet screens were removed on April 1 with fish allowed to volitionally emigrate from the ponds. Results of this study were published in the North American Journal of Aquaculture 64:267-277, 2002. Although this research has not continued to this date, portions of coho are still placed in the “Creek Pond”, where the NATURES rearing research was conducted in order to utilize the natural rearing components added to that pond. From 30,000 to 100,000 fish are placed in this pond and are volitionally released to the Elochoman starting in April.

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 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.

418,000 yearling smolts at 17 fpp at the Elochoman Hatchery (RKm 11.3) starting with a volitional release in April.

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

Coho are released from pond 23 at the hatchery location. See above.

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

	Yearling Release		
Release Year	No.	Date (MM/DD)	Avg Size (fpp)
1993	593300	April 1-30	18.0
1994	534500	April 1-30	15.0
1995	468300	April 1-30	18.0
1996	NA	NA	NA
1997	622708	April 1-30	12.0-16.0
1998	338900	April 1-30	13.0
1999	263500	April 1-30	12.0
2000	360525	April 1-30	16.0
2001	482108	April 1-30	17.0

10.4 Actual dates of release and description of release protocols.

Release dates and release methods have varied over the years. Both volitional and forced released on the last few fish remaining in the ponds has been used. Releases occur when outlet screens are removed and water levels are lowered by stop log removal (flushing), or kept pooled by leaving stoplogs in (volitional). In 1996, S-type coho were flush released from pond 22 on April 9. In 1997 S-type coho were flush released on 4/3/98. N-type coho volitional emigrated from 4/15 5/11. April to June is the release period (WDFW BRD 2004).

10.5 Fish transportation procedures, if applicable.

Releases are not trucked.

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

Fish are reared, acclimated, and released as subyearling smolts directly from the rearing/acclimation units at the Elochoman Hatchery. Fish are reared initially using Clear Creek water and switched to 100% Elochoman River water until release. Type S and N coho are mixed at the acclimation pond.

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

30,000 (7%) of the program production is adipose/CWT marked as an index group for management purposes. The remainder of the production (388,000) is Ad Clipped. All carcasses and trapped salmon are examined for fin clips (mark sampling) and snouts taken from fish with missing adipose and ventral fins collected in carcass surveys. Lengths, sex, and scales will be randomly (biological sampling) taken from trapped adults and carcasses with the adipose fin intact and from all adipose-clipped fish recovered. Snouts from the adipose-clipped carcasses 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. Pending discussion, fish can be transferred, released, planted to a landlocked lake, or destroyed.

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.

Emergency procedures and disposition of fish would adhere to the protocols and procedures set forth in the Program Section 7 Permit. If the program is threatened by ecological or mechanical events, the Complex manager would contact and inform regional management of the situation. Based on a determination of a partial or complete emergency release of program fish, if an on-station emergency release was authorized personnel would pull screens and sumps and fish would be forced released into the Washougal River.. No release of fish will occur without a review by WDFW Fish Management and a risk assessment is performed.

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 only smolts through fish culture and volitional release practices fosters rapid seaward migration with minimal rearing of delay in the rivers, limiting interactions with naturally produced steelhead juveniles.
- WDFW uses acclimation and release of smolts in lower river reaches where possible, this in an area below known wild fish spawning and rearing habitat.
- WDFW has reduced the program release size and program numbers produced at Elochoman Hatchery.
- Release is after peak chum emergence and emigration.
- All program fish are mass marked for easy identification.
- 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 will be reviewing Elochoman programs that drives the current release dates. Additional funding for revamping the adult pond to a juvenile facility or adding an extra rearing pond will be beneficial to the steelhead and Chinook programs that "stack" behind the coho production which drives the current release dates. Staff is also reviewing steelhead and Chinook rearing operations that currently impact the coho release dates.
- WDFW fish health and operational concerns for Elochoman Hatchery programs are communicated to Region 5 staff for 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.

Current Fish program staff is available to complete monitoring and evaluation needs while research is on going for coho interaction in the Lewis River. Funding and staff is available to continue the baseline monitoring for the Lower Columbia Management Area (LCMA) although funding reductions prevent increasing the baseline sites needed.

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.

Section 12. Research

12.1 Objective or purpose.

Past research using Type S coho is detailed in Fuss et. al. (1999a). No research on Elochoman coho is planned at this time.

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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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	Elochoman Hatchery Coho Program
Location of hatchery activity	Elochoman River
Dates of activity	November – January
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	0	nya
Intentional lethal take (f)	nya	nya		nya
Unintentional lethal take (g)	nya	nya	0	nya
Other take (specify) (h)	nya	nya	Nya	nya

* Chinook are not encountered during N coho broodstock collection (Lower Columbia River Fisheries Development Programs Semi-Annual Operations Report – FPMA 03-01 October 1, 2002 through April 30, 2003).

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	Elochoman Coho Program
Location of hatchery activity	Elochoman River
Dates of activity	November – January
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	0	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

* Chum are not encountered during N coho broodstock collection (Lower Columbia River Fisheries Development Programs Semi-Annual Operations Report – FPMA 03-01 October 1, 2002 through April 30, 2003).

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 (proposed)

ESU/Population	Lower Columbia River Coho
Activity	Elochoman Hatchery Chinook Program
Location of hatchery activity	Elochoman River
Dates of activity	October – 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		nya
Capture, handle, tag/mark/tissue sample, and release (d)	nya	nya	nya	nya
Removal (e.g., broodstock (e)	nya	nya	Up to 370	nya
Intentional lethal take (f)		nya	Up to 370	nya
Unintentional lethal take (g)	Up to 49,320*	Up to 44,881*		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