HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	Elochoman Fall Chinook Program
Species or Hatchery Stock	Chinook Salmon *(Oncorhynchus tshawytscha)*
Agency/Operator	Washington Department of Fish & Wildlife
Watershed and Region	Elochoman Subbasin/Columbia River Estuary Province
Date Submitted	nya
Date Last Updated	August 16, 2004

Section 1: General Program Description

1.1 Name of hatchery or program.

Elochoman River Fall Chinook

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

Chinook Salmon *(Oncorhynchus tshawytscha)*

ESA Status: Threatened

1.3 Responsible organization and individuals.

Name (and title):	Aaron Roberts
	Lower Columbia Hatcheries Complex Manager
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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)	$380,000

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 Tule Fall Chinook Salmon
Broodstock collection location (stream, RKm, subbasin)	WDFW Temporary Weir-V Trap/Elochoman River/RKm 4.8/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 - Production is directed at providing harvest opportunities outside the Elochoman River including ocean fisheries and mainstem Columbia fisheries. This integrated program would also provide hatchery contribution to the natural spawning population. The proposed integrated strategy for this program is based on WDFW's assessment of the genetic characteristics of the hatchery and local natural populations, the current and anticipated productivity of the habitat used by the populations, the potential for successfully implementing as isolated program, and NOAA's proposed listing determination (69 FR 33102; 6/14/2004). Modification of the proposed strategy may occur based upon NOAA's final listing determination and as additional information are collect and analyzed.

A known level of integration will be possible with the onset of mass marking (adipose fin clip). WDFW has asked for federal funds to implement mass marking of federally funded Mitchell Act fall chinook. The FFY 05 request is for funds to purchase mass marking trailers. The FFY 06 request will be for operating funds. Upon successful receipt of this funding, marking of brood year 2005 fall chinook would begin in the spring of 2006.

1.7 Purpose (Goal) of program.

- Plant 2,000,000 smolts at 80.0 ffp into the Elochoman River.
- Produce chinook salmon to mitigate for activities within the Columbia River Basin that have decreased salmonid populations and for the loss of chinook salmon that would have been produced naturally in the Elochoman River system.
- With mass marking, incorporate a level of natural stock into the existing hatchery population to support overall ESU recovery goals.
- Operate hatcheries consistent with the recovery of fall chinook salmon in the Elochoman River. The major hatchery issues are: 1) to maintain the genetic diversity of fall chinook in the Elochoman River, and ensure the reproductive success of wild fall chinook meets or exceeds recovery goals, 2) minimize the ecological interactions of hatchery fall chinook on naturally produced salmon and steelhead, and minimize the mortality of naturally produced juvenile and adult salmon and steelhead due to facility operations.

1.8 Justification for the program.

- Legal justification includes: Columbia River Fisheries Development Program, Columbia River Fish Management Plan and *U.S.vs.Oregon* court agreements.
- WDFW protects listed fish and provides harvest opportunity on the Elochoman River fall chinook 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 allow for abundant utilization of available habitat, 2) ensure 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 populations in the Lower Columbia River (LCR) Evolutionary Significant Unit (ESU) will be managed to promote the recovery of these species. The Congressional motivation for Mitchell Act passage was recognition that the salmon fishery of the Columbia River was in a serious and progressive decline due to habitat destruction and alteration from dam construction and operation, deforestation and other forest practices, pollution, water diversions, and over fishing. Legal justification includes: Mitchell Act, Pacific Northwest Electric Power Planning and Conservation Act, and *U.S. vs. Oregon* court agreements.

In order to minimize impact on listed fish by WDFW facilities operation and the Elochoman fall Chinook program, the following Risk Aversions are included in this HGMP:

Table 1. Summary of risk aversion measures for the Elochoman Fall Chinook 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. See also section 4.2.
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). See also section 4.2.
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. See also section 4.2.
Broodstock Collection & Adult Passage	7.9	Broodstock collection and sorting procedures can quickly identify listed fish, and if encountered, are handled per protocol to minimize impact as determined by WDFW Region 5 staff.
Disease Transmission	7.9, 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	2.2.3, 10.11	Current risk aversions and future considerations are being reviewed and evaluated for further minimizing impacts to listed fish. See also those sections.

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 0.054% smolt-to-adult survival (range 0.0299 - .0815%) 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 of fish or eggs for use as broodstock. Maximize available natural origin broodstock (NOB) with mass marking	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). Adhere to WDFW stock transfer guidelines. (WDFW 1991).
Region-wide, groups are marked in a manner consistent with information needs and protocols to estimate impacts to natural and hatchery origin fish.	Use Ad+CWT (90,000/4.5%) for evaluation purposes.	Returning fish are sampled throughout their return for length, sex, and mark.
Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens. Follow Co-managers Fish Health Disease Policy (1998).	Necropsies of fish to assess health, nutritional status, and culture conditions.	WDFW Fish Health Section inspect adult broodstock for pathogens yearly and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, WDFW's Fish Health Section recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as deemed necessary. A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.
	Release and/or transfer exams for pathogens and parasites.	1 to 6 weeks prior to transfer or release, fish are examined in accordance with the Co-managers Fish Health Policy
	Inspection of adult broodstock for pathogens and parasites.	At spawning, 60 adult broodstock are examined for pathogens.
	Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens and parasites	Controls of specific fish pathogens through eggs/fish movements are conducted in accordance to Co-managers Fish Health Disease Policy.

1.10.1 Risks:

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Minimize impacts and/or interactions to ESA listed fish.	Hatchery operations comply with all state and federal regulations. Hatchery juveniles are raised to smolt-size (80 fish/lb) and released from the hatchery at a time that fosters rapid migration downstream.	As identified in the HGMP: Monitor size, number, date of release and mass mark quality. Additional WDFW projects: straying, instream 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 instream 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 repairs 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. If possible, mass mark juvenile hatchery fish prior to release to enable state agencies to implement selective fisheries.	Harvests are monitored by agencies and tribes to provide up- to-date information.

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

WDFW has established an egg take goal of 2.3 million eggs in the Future Brood Document (2004 FBD). To meet this goal a total of 713 females and 713 males need to be collected annually, based on an average fecundity of 4,600 eggs and pre-spawning mortality of 30%. These numbers may need to be adjusted based on the success of efforts to reduce pre-spawning mortality. A pre-season meeting between WDFW Fish Programs staff will occur in June/July to review past hatchery operations, natural escapement, and to develop a plan for weir and hatchery operations during each upcoming fall season. However, 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.

Age Class	Max. No.	Size (ffp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Water-shed	Eco-province
Fingerling	2000000 FBD	80.0	June	Elochoman	11.3	Elochoman River	Columbia Estuary

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

		Return	Hatchery	Total
Brood year	**SAR (%)**	**Year**	**Escapement**	**Catch**
1995	0.0815%	1995	2,474	977
1996	0.0659%	1996	4,619	470
1997	0.0393%	1997	3,237	1,355
1998	0.0299%	1998	1,310	588
mean	0.0542%	**mean**	2,910	848

Data Sources – Regional Mark Information System (RMIS)/Pacific States Fishery Commission /WDFW

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

Hatchery releases of tule fall chinook began in 1950 when 70,000 fingerlings were released. This supplementation continued until the Elochoman River Salmon Hatchery was constructed under the Lower Columbia River Fishery Development Program in 1954. Brood stock for these hatcheries was obtained from local stock or from transfers from other hatcheries.

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:

Fall Chinook in the Elochoman River are collected at a weir at the upper end of tidewater. This is an integrated program and fish are collected according to a run timing curve of fish returning to the weir developed from previous years data. Hatchery fall chinook are not mass marked and the proportion of hatchery and wild fish in the broodstock is unknown. The past two years, WDFW has conducted field studies designed to improve the methodology for estimating the size of the naturally spawning fall chinook population. The naturally spawning population is mark sampled each year to derive a stock composition estimate used in run reconstruction. Hatchery fish spawning naturally in the Elochoman River include Elochoman Hatchery and Big Creek Hatchery (OR) fish. Mass marking of hatchery fall chinook would facilitate identification of wild fish.

1.16.2 Potential Alternatives to the Current Program:

Alternative 1: Mass mark hatchery fall chinook which would allow the wild component of the return to be identified.

Alternative 2: Modify release time or location, and/or reduce the size of the program. The primary ecological risks include competition, predation, and disease transfer between hatchery fall chinook and wild juvenile steelhead, cutthroat, coho, chum, and fall chinook. We are most concerned with competition between wild and hatchery fall chinook salmon. Data from other chinook populations suggests that wild fall chinook salmon migration peaks in February or March and continues through July.

1.16.3 Potential Reforms and Investments:

Reform/Investment 1: Fall chinook should be mass marked so that a measure of wild fish integration into the hatchery program and the proportion of hatchery spawners in the river can be accurately measured. Coded-wire-tagging and recovery programs must be sufficiently funded to meet the current management and science needs. Measures of spawning escapement including the proportion of hatchery and wild spawners must be accurate and precise and population estimates should include confidence intervals.

Limited information is available on the wild juvenile migration pattern of tule fall chinook salmon in the Lower Columbia ESU. Monitoring of hatchery and wild chinook migration should be considered in the Elochoman or other basins in the Lower Columbia River ESU to address issue. Also, little information is available on egg to fry and smolt to adult survival of naturally spawned fall chinook. CWT studies should be conducted to monitor natural production.

Reform/Investment 2: 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.

In addition to the barrier and fish ladder problems, all three intakes need 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 $$$$.

Section 2: Program Effects on ESA-Listed Salmonid Populations

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

This program is described in "Biological Assessment For The Operation Of Hatcheries Funded by The National Marine Fisheries Service (March 99)", Statewide Section 6 consultation with USFWS for interactions with Bull Trout, and concurrent with this HGMP to satisfy Section 7 consultations; WDFW is writing HGMP's to cover all stock/programs produced at Elochoman; fall chinook, Type N and S type coho, and summer and winter run steelhead.

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- Hatchery and Natural (Proposed)	Na	Na
H, M and L refer to high, medium and low ratings, low implying critical and high healthy.		

Identify the ESA-listed population(s) that will be directly affected by the program.

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

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

Columbia River chum salmon *(Oncorhynchus keta*) - Mainstem Chum were listed as threatened under the ESA on March 25, 1999.

Lower Columbia River Coho *(Oncorhynchus kisutch)* is proposed as threatened (June 14, 2004).

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

Describe the status of the listed natural population (s) relative to "critical" and "viable" population thresholds. Except for interim guidelines from WDFW on Chinook, critical and Viable population thresholds have not been established for these ESUs and the populations within them. NOAA has formed a Lower Columbia River/Willamette River Technical Review Team to review population status within these ESUs and develop critical and viable population thresholds.

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

Status: WDFW has submitted natural and hatchery management draft guidelines (Fall 2003) for Elochoman fall chinook that will be used in the interim until the TRT recommendations are developed. In 1950, estimated annual escapement of fall chinook in the Elochoman River was 2,000 fish (WDF 1951). 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. The portion of naturally produced fish in the broodstock program is unknown.

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

Year	Cowee-man River	Eloch o-man River	Grays River	Skamo -kawa Creek	Cowltiz River	Gree n River	Toutl e River	Kalam a River	EF Lewis River	NF Lewis River	Washouga l River
1990	241	136	287	123	2,698	123		20,54	342	17,50 6	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	14,16 6	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	15,00 0	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: Critical and Viable population thresholds have not been established for Lower Columbia chum and the populations within them. NMFS has formed a Lower Columbia River/Willamette River Technical Review Team (TRT) to review population status within these ESUs and develop critical and viable population thresholds. 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. Data for Grays River chum is presented here: 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 WDFW 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								

Lower Columbia River Coho (Oncorhynchus kisutch) is currently a candidate for listing but has been proposed as threatened on June 14, 2004.
Status: NOAA 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. NOAA has determined that these artificially propagated stocks are genetically no more than moderately divergent from the natural populations (NOAA, 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. In 1951, WDFW estimated an annual escapement of 2500 late coho to the Elochoman River and 2,000 late coho to Skamokawa Creek. Hatchery production accounts for most coho returning to the Elochoman River. Natural coho production is presumed to be very low. Smolt density models estimated Elochoman basin production potential of 43,393 smolts. (LCFRB Elochoman Subbasin Report, Volume 11, Chapter 5).

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

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

Broodstock Program:

Broodstock Collection: Program broodstock is derived from adults trapped and hauled from the Foster Road weir site (RM 3 on the Elochoman River). This collection point is just upstream of tidal influence. There is limited spawning potential up river, due to low in-stream flow during this period (elevated temperature stress and potential stranding). The trap consists of a temporary rack and picket structure placed across the river, prior to August 15 and operates until mid-October annually. After capture, adults are transferred to the hatchery for holding, spawning and incubation. Elochoman River fall chinook migration begins from early August to early September, depending, in part, on early fall rain. Natural spawning occurs between late September and mid October, usually peaking in early October. WDFW Region 5 Fish Program staff plans upcoming adult handling in a preseason meeting with hatchery staff. There is staff communication to handle unforeseen or weather related events that can impact runs and procedures. Until mass marking, hatchery chinook cannot be identified from listed chinook. Chum are not seen this far upstream. Currently, unmarked coho are passed upstream as they are encountered (see Elochoman Type S coho HGMP for updated information and Take Tables at the end of the document.)

Genetic introgression: As fish are not mass marked, there is potential that listed fish could be part of the broodstock collection. Although final escapement objectives have not been established by the NMFS through a recovery plan, WDFW has established interim minimum escapement objectives. The minimum fall chinook MSY escapement goal is 300 adult spawners passed above the weir (based on habitat between the weir and hatchery). Since some fish swim through the weir, this would lead to an average escapement of 333 spawners in most years. On average, an additional 100 fish spawn below the rack yielding a minimum total escapement of 433 spawners. Suitable spawning area also exists above the hatchery, up to at least the West Fork. WDFW will develop escapement objectives above the hatchery based on the available habitat by 2004. These objectives are considered draft and will be revised annually at pre-season meetings, used to valuate/review past season performance and to incorporate necessary changes into the upcoming seasons management strategy. 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 site while another intake is situated 0.5 miles upstream During low flows of late summer and early fall, this bypass reach suffers from a loss of water and minimal flows (Mitchell Act Hatcheries Intake and Fish Passage Study report April (2003). 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. Although pathogens occur in the wild and fish might be affected, they are believed to go undetected with predation quickly removing those fish. In addition, although pathogens may cause post release mortality in fish from hatcheries, there is little evidence that hatchery origin fish routinely infect natural populations of salmon and steelhead in the Pacific Northwest (Enhancement Planning Team 1986; Stewart and Bjornn 1990). Prior to release, the health and condition of the fall chinook population are established by the Area Fish Health Specialist. This is commonly done 1-3 weeks pre-release and up to 6 weeks on systems with

pathogen free water and little or no history of disease. Indirect take from disease effects is unknown.

Release:

Hatchery Production/Density-Dependent Effects: Hatcheries can release numbers of fish that exceed the density of the natural productivity in a limited area for a short period of time and can compete with listed fish. Elochoman fall chinook releases have been 2,000,000 since 2000 which is a 50% reduction from levels of the early 1990's. Chinook are released June 1- 15 at approximately 80 FPP but due to environmental conditions, fish size can range from 50-80 FPP depending on rearing conditions and water availability. This time frame is considered later than natural fall chinook migrate and allows dispersal of earlier on station coho and steelhead releases. Indirect take from density dependent effects 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, fall chinook and 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." Studies have shown that coho moved downstream quickly, suggesting that coho spend little time in the river after release (Fuss et al, 2000). Coho smolts released from the Marblemount Hatchery on the Skagit River migrated approximately 11.2 river miles day (Puget Sound data from Seiler et al. 1997; 2000). Fish released on station release into large river 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). Snorkeling studies on the Elochoman River indicated most hatchery-released chinook had migrated after 2 weeks (Fuss et al, 2000).
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 watersheds within days or weeks.

Predation (Freshwater): Chinook fingerlings 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 juvenile chinook or chum posed by the Elochoman Hatchery programs. In the absence of site-specific empirical information, the identification of risk factors can be a useful tool for reviewing hatchery programs while monitoring and research programs are developed and implemented.

Predation Risk Factors:

Environmental Characteristics: These characteristics can influence the level of predation (see SIWG (1984) for a review) with risk greatest in small systems during periods of low flow and high clarity. The Elochoman River is a medium sized, rain fed stream. Historical flows range from a high of 8,000 cfs to a low of 10cfs. From April 1 flows, averaging approximately 600 cfs, can drop significantly to less than 200 cfs by mid May (adapted from Wade 2002).

Dates of Release: Chinook smolts are released starting early in June and can continue through the third week of June. Release is during a period of natural out-migration. Getting Size of fish is a determining factor. This release period is after the listed chum emigration from this system and the Grays River/Sea Resources programs.

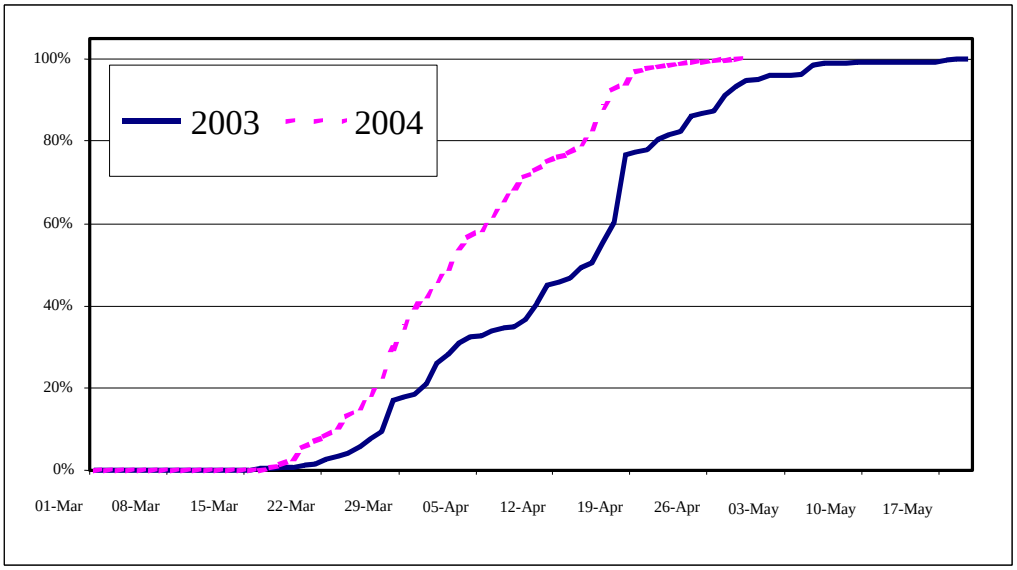
Relative Body Size: Studies and opinions on size of predator/prey relationships vary greatly and although there is evidence that salmonids can prey upon fish up to 50% of their body length, most prey consumed is probably much smaller. Keeley and Grant (2001) suggest that the mean prey size for 100-200 mm fl salmonids is between 13-15% of predator body size. Salmonid predators were thought to be able to prey on fish up to approximately 1/3 of their length (USFWS 1994), although coho salmon have been observed to consume juvenile chinook salmon of up to 46% of their total length in aquarium environments (Pearsons et al. 1998). Artic char are well known as piscivorous predators, but recent studies suggest the maximum prey size is approximately 47% of their length (Finstad et al. 2001). The "33% of body length" criterion for evaluating the potential risk of predation in the natural environment has been used by NOAA Fisheries and the USFWS in a number of biological assessments and opinions (c.f., USFWS 1994; NMFS 2002). Although predation on larger chinook juveniles may occur under some conditions, WDFW believes that a careful review of the Pearson and Fritts (1999) study supports the continued use of the "33% of body length criterion" for listed species until further data for this system can be collected.

Potential Elochoman fall Chinook predation and competition effects on listed salmonids: The proposed annual production goal for this program is 2,000,000 fish released in June (June 10-25 typically). This time frame of volitional release could encounter late emigrating or rearing listed chinook or chum in the Elochoman subbasin and Columbia mainstem. Due to similar sizes between chinook smolts and fingerling phases of listed stocks, competition could have an impact if hatchery chinook do not emigrate quickly. At 80 FPP (80 mm fl), potential predation would be on listed fish less than 27 mm fl and smaller. Below are some data from Lower Columbia River streams:

- Fork length (fl) of naturally produced chinook 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 chinook lengths of 36mm – 40mm from March to April 1 (P. Hanratty, WDFW, pers comm. 2004).
- Average fork length by week from 26 sampling sites on the Kalama River by week indicate chinook of 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 (Pettit 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. Direct take from predation and competition is unknown.

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). There is a low risk of take as chum have emigrated from the area and are not at a size vulnerable to predation from the tule chinook program. 95% of the chum emigration has occurred by the end of April reducing potential competition (Chum graph 1). The Grays River and the Sea Resources chum programs are closely aligned with the Duncan Creek program.

Figure 1. Duncan Creek Chum out-migration



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 Hatchery coho fry data 2001).

Indirect take from competition and predation is unknown.

Residualism: To maximize smolting characteristics and minimize residualism:

- WDFW adheres to a combination of acclimation, volitional release strategies, size, and time guidelines.
- Condition factors, standard deviation and coefficient of variation on fish lengths are monitored and measured throughout the rearing cycle and adjusted towards the release time for optimum smolt conditions.
- Releases have occurred from acclimation facilities on the parent river.

Indirect take from residualism is unknown.

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. 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 that environment. Indirect take in the migration corridor or ocean is unknown.

Monitoring:

Associated Monitoring Activities - The following monitoring 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).

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.

Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.
Take of chinook has been unknown, take of chum has not been documented in this operation and listed coho (proposed) have been sorted and released upstream. No pond mortalities have been reported by staff.

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 chinook 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.

Total annual harvest is dependent on management response to annual abundance in PSC (U.S/Canada), PFMC (U.S. ocean), and Columbia River Compact forums. WDFW also has received authorization for tributary, Columbia River mainstem, and ocean fisheries; the combined harvest rates in the Fisheries Management and Evaluation Plan (FMEP), Columbia River Fish Management Plan (CRFMP), and ocean fisheries are reviewed annually in the North of Falcon process to ensure the harvest rates are consistent with recovery of the Lower Columbia river tule chinook population.

Lower Columbia chinook ESU consists of spring, fall tule, and fall bright fish runs. These runs are impacted differently by fisheries outside the LCMA and outside WDFW management. Lower Columbia fall chinook are more heavily impacted by ocean fisheries-CWT recoveries in the 1990s indicate the majority of the Elochoman fall chinook stock harvest occurred in British Columbia (36%), Alaska (38%), Washington ocean (6%), and Columbia River (14%). The ocean exploitation rate for tule fall chinook averaged 53% from 1977 to 1990 but was reduced to 25% between 1991 and 1994 due to low abundance. The combined mainstem and tributary fishery impacts for tule chinook are less than 1/2 of the ocean fishery and have been reduced from 11% to 5% (NMFS 2000).

In addition to Columbia River commercial gill net and sport fisheries. Lower Columbia River tule fall chinook are an important contributor to Washington ocean sport and troll fisheries and to the lower Columbia estuary sport fishery. Columbia River commercial harvest occurs primarily in September, but tule chinook flesh quality is low once the fish move from salt water. Harvest is constrained by Coweeman fall chinook, total ESA exploitation rate is 49%. (LCFRB Elochoman Basin Plan Volume 2, Chapter 5).

Brood year	SAR (%)	Return Year	Hatchery Escapement	Total Catch
1995	0.0815%	1995	2,474	977
1996	0.0659%	1996	4,619	470
1997	0.0393%	1997	3,237	1,355
1998	0.0299%	1998	1,310	588
mean	0.0542%	**mean**	2,910	848

3.4 Relationship to habitat protection and recovery strategies.

Subbasin Planning and Salmon Recovery:
The current Elochoman HGMP process is 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 for recovery plans by the Lower Columbia Fish Recovery Board (LCFRB) for listed fish and may well use HGMP listed alternatives on how to utilize hatchery programs to achieve objectives and harvest goals. In order to assess, identify and implement restoration, protection and recovery strategies, WDFW Region 5 staff is involved in fish and wildlife planning and technical assistance in concert through the LCFRB including the role of fish release programs originating from 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 Kalama River fall Chinook 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 chinook smolts can be preyed upon through 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 Caspian terns, gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons. Populations of mammals that can take a heavy toll on migrating smolts, and returning adults include: harbor seals, sea lions (increasing since the 1970's), river otters, and Orcas.

(2) Salmonid and non-salmonid fishes or species that could be negatively impacted by the program: Co-occurring natural salmon and steelhead populations in local tributary areas and the Columbia River mainstem corridor areas could be negatively impacted by program fish. Of primary concern are the ESA listed endangered and threatened salmonids: Snake River fall-run Chinook salmon ESU (threatened); Snake River spring/summer-run Chinook salmon ESU (threatened); Lower Columbia River Chinook salmon ESU (threatened); Upper Columbia River spring-run Chinook salmon ESU (endangered); Columbia River chum salmon ESU (threatened); Snake River sockeye salmon ESU (endangered); Upper Columbia River steelhead ESU (endangered); Snake River Basin steelhead ESU (threatened); Lower Columbia River steelhead ESU (threatened); Middle Columbia River steelhead ESU (threatened); and the Columbia River distinct population segment of bull trout (threatened). Listed fish can be impacted thru a complex web of short and long term processes and over multiple time periods which makes evaluation of this a net effect difficult. WDFW is unaware of studies directly evaluating adverse ecological effects to listed salmon. See also Section 2.2.3 Predation and Competition.

3) Salmonid and non-salmonid fishes or other species that could positively impact the program. Multiple programs including Type S and 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).

4) Salmonid and non-salmonid fishes or species that could be positively impacted by the program. Elochoman Chinook smolts can be preyed upon release thru the entire migration corridor from the river subbasin to the mainstem Columbia River and estuary. 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. Northern pikeminnows and introduced spiny rays in the Columbia mainstem sloughs can predate on smolts as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons. Mammals that benefit from migrating smolts and prey on returning adults include: harbor seals, river otters, sea lions and Orcas. 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 release 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. Assuming integrated spawning and carcass seeding efforts, approximately 1,000 – 5,000 fall chinook adult carcasses could contribute approximately 10,000 – 50,000 pounds of marine derived nutrients to organisms in the Elochoman river. *Saprolegniasis* occurrences in young hatchery fish have been observed with greater frequency at Mitchell Act stations that have nutrient enhancement projects in place. In addition, circumstantial evidence suggests more outbreaks of gill and tail fungus are the result of nutrient enhancement efforts. Staff is continuing to monitor occurrences of this possibility.

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 water 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).

Due to low river flows during the late summer and early fall, broodstock are trapped at the Foster Road trap site (RM 3.0) slightly upstream of the main Columbia river tidal influence. A temporary barrier "picket weir" is constructed across the river to direct the fish to a trap located on the east side of the river. The trap is equipped with a brail-hoist lift to load adults directly into tank trucks for transport to the hatchery.

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

Broodstock are brail-hoisted from the trap site into a 1000 gallon tankers to be transferred to the hatchery with the trip taking approximately 20 minutes. Salt at 5% solution (50 lbs/1000 gallons) is added per trip. Chinook adults are placed in pond 21 at the hatchery. Even with its large volume and water inflow, which has improved adult survival to spawning, significant mortality from fungal infestations and temperature stress is a problem.

Equipment Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Truck with Tank	1200	Y	N	NA	None	NA
Truck With Tank	1000	Y	N	NA	None	NA

5.3 Broodstock holding and spawning facilities.

Fall chinook are transferred to an asphalt slope sided pond with a volume of 135,000 cubic feet. Adults can volitionally enter pond 21 from the hatchery site. The pond is supplied with 2,500 gallons per minute (gpm) of fresh water. Integrated Hatchery Operations Team (IHOT) adult holding guidelines are followed for adult holding, density, water quality (except temperature) 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	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

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.

Incubator Type	Units (number)	Flow (gpm)	Volume (cu.ft.)	Loading-Eyeing (eggs/unit)	Loading-Hatching (eggs/unit)
Magnum Deep- Free Style Bulk Eyeing Incubators	18	12	nya	80000	nya
Heath Stack Trays Units (24- 1/2 Stacks)	120	4	nya	nya	6700

5.5 Rearing facilities.

Swim up fry are ponded into concrete raceways. After initial rearing in concrete raceways, fingerlings are separated to the larger receptacle for rearing until release.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Flow Index	Max. Density Index
20	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	0.30

5.6 Acclimation/release facilities.

Same, see HGMP Section 5.5 above.

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

Severe rain events lead to flooding and associated debris and sediments chronically affect fish production programs at this facility. Typically, flow interruptions and silt in the incubation system can occur during sensitive stages, which can result in the loss of eggs.

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

- All pumps, broodstock holding, incubation and rearing receptacles have water loss alarms.
- Staff is available 24/7 to respond to pump failure, water loss, and flooding events.
- Fish health protocols through broodstock collection, incubation and rearing phases are followed and monitored monthly.
- Broodstock collection is checked daily for program and listed fish.
- Staff monitors the trap operation daily to keep the numbers of fish stacking in the trap area to manageable numbers. Large numbers can create density problems for listed fish if they are not removed expeditiously.

Section 6. Broodstock Origin and Identity

6.1 Source.

During the first few years of operation, juvenile fall-run chinook salmon from Spring Creek NFH were used to establish the hatchery run. This hatchery stock is considered to be widely mixed due to stock transfers from other facilities (WDF et al. 1993). For the last 5 years all adults used for broodstock have been collected at the temporary trap at RM 3 on the Elochoman River. The overall result of straying and transfers of fall chinook at lower Columbia River hatcheries is the development of a widely distributed, blended hatchery stock. Returns of adults to the hatchery have averaged 2,580 fish from 1987 through 2000.

6.2.1 History.

This is a mixed stock with composite production and is similar in life history to other tule fall chinook stocks in the lower Columbia. A native fall chinook population existed in the Elochoman prior to the construction of the Elochoman Hatchery in 1953. Since then most natural spawners have been excess hatchery fish. In 1997, 82% of naturally spawning chinook in the Elochoman were hatchery-origin fish (Harlan, K. 1999. Washington Columbia River and tributary stream survey sampling results, 1998. Washington Department of fish and Wildlife (WDFW), Columbia River Progress Report. 99-15, Vancouver, WA. The size of historical fall chinook runs in the Elochoman River is difficult to determine. At the time the first spawning ground surveys were conducted in the 1940s, the natural stream habitat had been seriously damaged by logging practices. Records of initial surveys done for the Columbia River Fisheries Development Program in 1948 and 1949 document serious logjams, splash dams forming complete blockages, and logging-related landslides, siltation, and erosion. These impacts, coupled with harvest, limited natural production in this period. Straying of lower river hatchery (LRH) fall chinook from a number of Oregon and Washington hatcheries is not unusual, and contributes to natural production.

Broodstock Source	Origin	Year(s) Used	
		Begin	End
Elochoman River Tule Fall Chinook	H	U	Present
Washougal River Tule Fall Chinook	H	1992	2001
Kalama River Tule Fall Chinook	H	1992	1995
Abernathy Creek Tule Fall Chinook	H	1991	1991
Spring Creek NFH Tule Fall Chinook	H	U	1991
Grays River Tule Fall Chinook	H	1998	1998

6.2.2 Annual size.

WDFW has established an egg take goal of 2.3 million eggs in the Future Brood Document (FBD). To meet this goal a total of up to 713 females and 713 males need to be collected annually, based on an average fecundity of 4,600 eggs and pre-spawning mortality of 30%. At the pre-season meeting Fish and Hatchery Program staff will develop the weekly and cumulative broodstock collection goals, and evaluate run size forecasts.

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

Unknown. When mass marking is initiated, integrated levels will be determined.

6.2.4 Genetic or ecological differences.

For the last 5 years all adults used for fall chinook broodstock have been collected at RM 3 on the Elochoman River. Straying of lower river hatchery (LRH) fall chinook from a number of Oregon and Washington hatcheries is not unusual, and contributes to natural production. The overall result of straying and transfers of fall chinook at lower Columbia River hatcheries is the development of a widely distributed, blended hatchery stock. The current broodstock is derived from stock returning to the subbasin. There are no known genotypic, phenotypic, or behavioral differences between either the hatchery stock or natural stock in the subbasin. Fall chinook propagated through the program represent the indigenous lower Columbia stock. During years where insufficient numbers of adults return, eggs may be obtained from other lower Columbia River hatchery facilities with tule fall chinook if available. Also see Section 7.9.

6.2.5 Reasons for choosing.

This stock has a run entry pattern and timing that provides harvest opportunities for fisheries in the subbasin, the lower Columbia mainstem/tributaries, and Washington/Oregon Coast . The broodstock chosen has the desired life history traits to meet these harvest goals (e.g. run-timing) that provides significant harvest to the ocean fisheries and lower Columbia River fisheries (e.g. Buoy 10). Fall chinook propagated through the program represent the indigenous lower Columbia stock.

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

- WDFW has established interim minimum escapement objectives.
- Every effort shall be made to promote local adaptation of this fall chinook population and out of basin hatchery transfers of eggs or fish for use as broodstock will only be considered in extreme cases.
- Mating cohorts are randomly selected.
- 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 will be released immediately, if encountered during the broodstock collection process.

Section 7. Broodstock Collection

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

Adults for broodstock.

7.2 Collection or sampling design

Program broodstock is derived from adults trapped and hauled from the Foster Road weir site (RM 3 on the Elochoman River). This collection point is just upstream tidal influence with limited spawning potential up river which is limited by in-stream flow during this period (elevated temperature stress and potential stranding). The trap consists of a temporary rack and picket structure placed across the river, prior to August 15 and mid-October annually. After capture, adults are transferred to the hatchery for holding, spawning and incubation. Egg Take Goal Objectives include: taking eggs across the run, collecting brood proportioned to the run return, on low return years, build in a buffer early in the season to ensure egg take is met, adjust collection of adults in-season based on actual returns and measure fecundity and mortality in-season and adjust egg take as needed. Surplus fish can be used for nutrient enhancement in the subbasin once nutrient enhancement needs are satisfied, any additional surplused fish could be available for sale to a contract buyer or donated to foodbanks.

7.3 Identity.

Hatchery releases of tule fall chinook began in 1950 when 70,000 fingerlings were released. This supplementation continued until the Elochoman River Salmon Hatchery was constructed under the Lower Columbia River Fishery Development Program. Brood stock for these hatcheries was obtained from local stock or from transfers from other hatcheries. Spring Creek Hatchery fall chinook (Bonneville Pool Hatchery stock) have been the primary fall chinook stock transferred to lower river hatcheries. Straying of lower river hatchery (LRH) fall chinook from a number of Oregon and Washington hatcheries is not unusual, and contributes to natural production. The overall result of straying and transfers of fall chinook at lower Columbia River hatcheries is the development of a widely distributed, blended hatchery stock.

Currently, approximately 90,000 fish from each brood year are coded-wire tagged plus adipose-fin clipped. This portion is approximately 4.5% of the total production (2,000,000) annually. The Agency goal is a 100% adipose clip of all hatchery-produced fall chinook to be able to distinguish the target population of hatchery origin fish from naturally spawning fish. If implemented with the 2005 brood, marked adults would expected to return in 2008.

Rogue River fall chinook are reared for the Oregon Select Area fisheries program (Young's Bay) and these can be identified by an adipose and left ventral fin clip. These fish are sacrificed for CWTs and to maintain local genetic diversity and adaptation. In some years fish were transferred back to Oregon, with some males sold to a contract buyer or donated to foodbanks.

7.4 Proposed number to be collected:

7.4.1 Program goal (assuming 1:1 sex ratio for adults): A total of 713 females and 713 males need to be collected annually, based on an average fecundity of 4,600 eggs and pre-spawning mortality of 30%.

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	713	713	14	nya	nya
1995	541	715	41	nya	nya
1996	825	904	8	nya	nya
1997	502	377	12	nya	nya
1998	568	535	10	nya	nya
1999	895	927	8	nya	nya
2000	700	700	U	nya	nya
2001	700	700	U	nya	nya

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

Fish can be released upstream for additional natural spawning (habitat available to the West Fork). Also, fish can be surplused (sold or donated) after nutrient enhancement goals have been met. A formal nutrient enhancement plan needs to be completed for the Elochoman River watershed. The highest priority for hatchery carcasses approved for nutrient enhancement is the upper basin. Prior to October 5th, carcass placement should occur on the North Fork at least one mile above the confluence with the East Fork. Placement in this location limits the possibility that carcasses will wash into the index area below the East Fork. All female and male carcasses (including mortalities) released for nutrient enhancement shall have their bellies slit to distinguish these from natural spawners. PSMFC/WDFW staff will likely be conducting a "peak count" prior to October 5th in the index area below the East Fork. PSMFC/WDFW staff will contact hatchery staff if a change in peak run timing mandates any change to the October 5th date.

7.6 Fish transportation and holding methods.

Adults are transferred from the lower weir site starting in early August. Broodstock are brailed from the trap site into 1000 gallon tankers. Salt at 5% solution (50 lbs/1000 gallons) is added per run with the trip to Elochoman hatchery with the trip taking approximately 15 minutes. Fish are held in an asphalt sided pond with a volume of 135,000 cubic feet and a flow of 2,500 gpm after being transported by truck from the trap site. While females are being held to maturity, they receive prophylactic treatments for fungus control and injections with antibiotics (Oxytertracycline) on arrival. In some years, males can also be injected due to higher than normal pond mortalities.

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.

Integrated Hatchery Operations Team (IHOT), Pacific Northwest Fish Health Protection committee (PNFHPC), WDFW's Fish Health Manual November 1966, updated March 30, 1998 or tribal guidelines are followed. Fish health specialists make monthly visits and consult with staff. 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. 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.

7.8 Disposition of carcasses.

Spawned (males only) and un-spawned carcasses (both males and females) may be sold to contract buyer, donated to foodbanks or used for nutrient enhancement within the watershed.

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.

- Every effort shall be made to promote local adaptation of this fall chinook population and out of basin hatchery transfers of eggs or fish for use as broodstock will only be considered in extreme cases.
- Unlike hatchery steelhead, coho, and spring chinook, hatchery fall chinook from the Elochoman Salmon Hatchery are not mass marked, and we cannot distinguish hatchery and wild chinook salmon in this basin but up to 400 fish spawn naturally in this system. Mass marking for chinook programs could begin in 2005, with expected adult returns beginning in 2008.
- At least 500 adults are collected.
- Limit out of basin transfers of eggs or fish for use as broodstock, 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 will be released immediately, if encountered, during the broodstock collection process.

Section 8. Mating

8.1 Selection method.

Cohorts are utilized from the entire run cycle with males and females available on a given day mated randomly. Spawning is conducted weekly, and occurs over a period of up to six weeks with the peak in mid October. The spawning protocol mandates the use of a spawning population of at least 500 adults. Fish are spawned throughout the entire run to help ensure that the run timing for the stock is maintained. A portion of each day's egg take is used for on-site hatchery production to help ensure that the return timing of the seasonal run is represented.

8.2 Males.

The spawning protocol is described in the as follows; The intent is to use a spawning population of at least 500 adults (IHOT 1995 Volume III). 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 (WDFW Spawning Guidelines, 1983).

8.3 Fertilization.

Ovarian fluid is not drained prior to fertilization. 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. For daily egg takes, eggs from five females are spawned into a bucket and the sperm from five males are then combined with the eggs. Pooled egg lots are loaded into incubation units at the specified egg loading rates.

8.4 Cryopreserved gametes.

NA

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.

The current broodstock collection protocol will ensure that available genetic material represented reflects current broodstock history. When marking allows identification of wild stock, then acceptable wild stock integration levels can be followed.

Section 9. Incubation and Rearing.

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

Besides program goals, a total of 3,000 eyed eggs are transferred to the Kesinger remote site incubator (RSI) project. An additional 500 eyed eggs are given to WDFW Region 5 salmon in the classroom (SIC) projects.

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 (%)
1992	3788620	98.44	99.19	nya	95.7	nya	nya
1993	nya	nya	nya	nya	nya	nya	nya
1994	4735800	96.28	U	nya	97.66	nya	nya
1995	2089400	U	U	nya	U	nya	nya
1996	5303600	92.83	97.79	nya	U	nya	nya
1997	2108200	U	U	nya	U	nya	nya
1998	2689225	U	U	nya	U	nya	nya
1999	3766000	91.90	U	nya	73.81	nya	nya
2000	2300000	86.90	U	nya	99.60	nya	nya
2001	2300000	86.00	U	nya	98.40	nya	nya

9.1.2 Cause for, and disposition of surplus egg takes.

Egg takes are planned according to data/information of historical eggtakes at the Elochoman Hatchery. Thus, egg takes are maintained within the plus/minus 5% guideline of the Section 7 permit. BKD and viral sampling lots (60 fish lots) are conducted over the course of the season. Lots are removed for unacceptable levels of BKD and with any protocols involved due to viral sampling. Surplus eggs may be used to backfill production shortages at other lower Columbia facilities. Otherwise, the program broodstock collection goal set forth in the annual brood document usually prevents surpluses.

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 (approximately 1600 TU's) or based on (95% yolk absorption) KD factor. At this time fry are transferred to the appropriate starting raceway (See HGMP Section 5.5 for raceway specifications) this usually occurs during the last week of January and continues through February.

9.1.6 Fish health maintenance and monitoring.

Staff conducts daily inspection, visual monitoring and sampling from eyed egg, 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.

9.1.7 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

- IHOT and WDFW fish health guidelines followed.
- Multiple units are used in incubators.
- Splash curtains can isolate incubators.
- Temperature, dissolved oxygen, and flow are monitored.
- Dead eggs are discarded in a manner that prevents transmission

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 (%)
1992	3788620	98.44	99.19	nya	95.7	nya	nya
1993	nya	nya	nya	nya	nya	nya	nya
1994	4735800	96.28	U	nya	97.66	nya	nya
1995	2089400	U	U	nya	U	nya	nya
1996	5303600	92.83	97.79	nya	U	nya	nya
1997	2108200	U	U	nya	U	nya	nya
1998	2689225	U	U	nya	U	nya	nya
1999	3766000	91.90	U	nya	73.81	nya	nya
2000	2300000	86.90	U	nya	99.60	nya	nya
2001	2300000	86.00	U	nya	98.40	nya	nya

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

General guidelines for density and loading targets are as 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. IHOT standards are followed for: water quality, alarm systems, predator control measures to provide the necessary security for the cultured stock, loading and density. 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 in standard raceway ponds until late spring. They are moved to the asphalt pond (23) after release of the steelhead and coho programs for final rearing and release from that pond. 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. Rearing units are cleaned at least one time per week, using a vacuum system.

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

Rearing Period	Length (mm)	Weight (fpp)	Condition Factor	Growth Rate	Hepatosomatic Index	Body Moisture Content
January	nya	1000	nya	nya	nya	nya
February	nya	500	0.500	nya	nya	nya
March	nya	250	0.500	nya	nya	nya
April	nya	160	0.360	nya	nya	nya
May	nya	90	0.438	nya	nya	nya
June	nya	70	0.222	nya	nya	nya

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

See HGMP section 9.2.4 above. 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

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

Fish Health Monitoring	Policy guidance includes: *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). A fish health specialist inspects fish programs at Elochoman Hatchery monthly and checks both healthy and if present symptomatic fish. Based on pathological or visual observations 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. Red mouth outbreaks can be treated with Oxytertracycline for 14 days. 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 noticed by fish behavior. Aggressive screen and intake crowding, swarming against sloped pond sides, leaner condition factors, a more silvery physical appearance and loose scales during feeding events are signs of smolt development. ATPase activity is not measured.

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

None

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

See HGMP Sections 4.2, 5.8 & 9.1.7.

Section 10. Release

10.1 Proposed fish release levels.

2,000,000 sub-yearlings at 70 - 80 FPP are released at RKm 11.3.

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

Fish are released on station at the Elochoman Hatchery from the main earthen pond.

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

	Fingerling Release		
Release Year	No.	Date (MM/DD)	Avg Size (fpp)
1991	4386500	June 1-15	70
1992	3976000	June 1-15	70
1993	3570100	June 1-15	70
1994	1176000	June 1-15	70
1995	4452800	June 1-15	70
1996	2834700	June 1-15	70
1997	2000000	June 1-15	70
1998	2000000	June 1-15	70
1999	2513400	June 1-15	70
2000	1105000	June 1-15	70
2001	1992000	June 5-15	66
2002	2218100	June 10 - 25	69
2003	Na	Na	Na

10.4 Actual dates of release and description of release protocols.

Release dates can range from June 1 until June 25 and are usually dependant on water temperatures that allow growth to 80 fpp.

10.5 Fish transportation procedures, if applicable.

Fish are released directly from the rearing/acclimation facility.

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

Acclimation and imprinting to the Elochoman system occurs as program is reared and released as fingerling in a smolted condition directly from the rearing/acclimation units at the Elochoman Hatchery. The program from broodstock collection, and incubation through rearing stages occurs using a mixture of Clear Creek and Elochoman River water.

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

90,000 fish (4.5%) of the program is adipose/CWT marked as an index group for management purposes. CWT tags recovered from adults will be processed in Olympia. Scales and other biological data may be collected from adult fish as appropriate. 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

Egg takes are planned according to data/information of historical eggtakes at the Elochoman Hatchery. Thus, egg take and production are maintained within the plus/minus 5% guideline. For unforeseen events, the Hatchery Manager would contact the Complex Manager who would contact the appropriate WDFW Regional Manager to apprise him/her of the situation. Regional Manager would consult with appropriate regional co-managers/NOAA to get recommendation for fish disposition. The Hatchery Complex Manager would instruct hatchery to implement recommendation.

10.9 Fish health certification procedures applied pre-release.

Whenever abnormal behavior or mortality is observed, staff conducts the Area Fish Health Specialist. The fish health 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. All fish are examined for general condition and health as well as presence of "reportable pathogens" as defined in the PNFHPC disease control guidelines, within 1 to 3 weeks prior to release.

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 by parties involved in preseason meetings. If the program is threatened by ecological or mechanical events, the Complex manager would contact and inform WDFW 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 Elochoman River. No release of fish will occur without a review by WDFW Fish Management and a risk assessment. Regional manager would consult with appropriate regional co-managers/NMFS to get recommendation for fish disposition.

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 or delay in the river, 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 in the upper Green River.
- WDFW releases fish in late June which gives listed fish time to grow to a size that has minimal predation and competition impacts.
- WDFW proposes to continue monitoring, research and reporting of hatchery smolt migration performance behavior, and intra and interspecific interactions with wild fish to access, and adjust if necessary, hatchery production and release strategies to minimize effects on wild fish.
- WDFW fish health and operational concerns for Elochoman Hatchery programs are communicated to WDFW 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. In addition, another important aspect of hatchery management is the monitoring and evaluation of the genetic profile of hatchery-origin and of natural-origin stock(s). This is an ongoing monitoring need to evaluate changes in the genetic structure of both hatchery and natural populations and the amount and extent of gene flow between them. Achieving the monitoring and evaluation objectives requires handling fish and taking tissue samples for genetic analysis. Statistical considerations have led geneticists to identify a sample size goal of approximately 100 broodstock fish for such genetic monitoring.

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

To evaluate hatchery programs comprehensive monitoring and evaluation programs are needed. These programs at a minimum must measure adult hatchery and wild escapement, and fishery contributions from hatchery and wild salmonids for every stock. Reproductive success should be measured for representative wild and hatchery stocks. Ecological interactions (predation, competition, and disease) need to be measured for representative stocks as well. With the loss of Mitchell Act funding, staffing and logistical support may be lost to continue the monitoring and evaluation of this and other programs on the Columbia River.

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

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

Section 12. Research

12.1 Objective or purpose.

Applicable lower Columbia River fall chinook research work is being conducted at Kalama Falls.
1) Measure fecundity of fall chinook salmon at Kalama Falls Hatchery each year to determine temporal changes.
2) Compare these data to calculated fecundities obtained from hatchery records
3) Compare these data to data obtained at other Columbia Basin hatcheries.

12.2 Cooperating and funding agencies.

NOAA and WDFW.

12.3 Principle investigator or project supervisor and staff.

Jim Byrne, Fish Biologist, 600 Capitol Way N, Olympia, WA 98501-1091

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

Hatchery progeny only.

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

Individual females are measured to determine length and the age of the fish is determined by removing the snout if it contains a coded-wire tag or by removing and aging of scales if not tagged. The measured fecundity of the female is determined by passing the eggs through an electronic fish counter with accuracy of better than 95%. Fecundity by age is determined and the average measured fecundity of the brood is compared among broods and age classes.

12.6 Dates or time periods in which research activity occurs.

September through December.

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

Each lot of eggs is carefully passed through the fish counter before standard shocking and picking activities by the hatchery crew. Total number o f eggs are counted and the lot of eggs is replaced in the incubator for subsequent incubation and care by the hatchery crew.

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

A total of 20-30 hatchery females are used in the study.

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).

20-30 adults

12.10 Alternative methods to achieve project objects.

Two alternatives exist. The first is to use estimated fecundities obtained by dividing total egg collection by total females spawned (however this study is being done to check the accuracy of this method) and the second method is to hand count the eggs.

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

Coho and steelhead. No associated mortality to other species is expected due to this activity.

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.

None. No associated adverse ecological effects or injury/mortality to listed species is expected from this activity.

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 Fall Chinook
Activity	Elochoman Hatchery Fall Chinook
Location of hatchery activity	Elochoman Hatchery
Dates of activity	August - October
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	1426*	nya
Intentional lethal take (f)	nya	nya	1426	nya
Unintentional lethal take (g)	230,000	200,000		nya
Other take (specify) (h)	nya	nya	nya	nya

* With mass marking an accurate level of take will be possible.

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 Hatchery Fall Chinook
Location of hatchery activity	Elochoman Hatchery
Dates of activity	August - October
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	0*	nya
Capture, handle, and release (c)	nya	nya	0	nya
Capture, handle, tag/mark/tissue sample, and release (d)	nya	nya	nya	nya
Removal (e.g., broodstock (e)	nya	nya	nya	nya
Intentional lethal take (f)	nya	nya	nya	nya
Unintentional lethal take (g)	nya	nya	nya	nya
Other take (specify) (h)	nya	nya	nya	nya

* Chum are not seen at the Foster Road temporary weir or at the Elochoman River Salmon Hatchery.

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 Fall Chinook
Location of hatchery activity	Elochoman Hatchery
Dates of activity	August - October
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 - 5*	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	0	nya
Unintentional lethal take (g)	0	0	0	nya
Other take (specify) (h)	nya	nya	nya	nya

* Few coho are seen during chinook trapping.

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