HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	Wallace River Fingerling Summer Chinook Program
Species or Hatchery Stock	Wallace River Summer Chinook (*Oncorhynchus tshawytscha*)
Agency/Operator	Washington Department of Fish and Wildlife
Watershed and Region	Snohomish River Puget Sound
Date Submitted	August 04, 2005
Date Last Updated	July 27, 2005

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Wallace River Summer Chinook Fingerling Program

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

Wallace River Summer Chinook (*Oncorhynchus tshawytscha*) – listed as "threatened" June 2005.

1.3) Responsible organization and individuals

Name (and title):	Chuck Phillips, Region 4 Fish Program Manager	
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

In addition to the on-station WDFW Wallace River summer chinook program, 1.8 million eyed summer chinook eggs will be transferred to the Tulalip Tribal Bernie Kai Kai Hatchery for incubation, rearing and release of 1.7 million sub-yearling smolts each year (MOU, 1997). This egg-take and release of native Skykomish River summer chinook salmon at Tulalip reflects a major change in source of broodstock for the Tribal hatchery program, effectively beginning with the 2003-04 egg take.

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

Operational Information	Number
Annual operating cost (dollars)	$ 397,492
The above information for annual operating cost applies cumulatively to the Wallace River Hatchery Fish Programs and cannot be broken out specifically by program. Funding sources are General Fund – State, General Fund – Federal, Wildlife Fund – Local and Puget Sound Recreational Enhancement Fund.	

1.5) Location(s) of hatchery and associated facilities.

Broodstock Collection; Incubation; Rearing and Release:

Wallace River Hatchery: Located on the Wallace River (07.0940) at RM 4 at its confluence with May Creek (07.0943). Enters the Skykomish River (07.0012) at RM 36.

1.6) Type of program.

Integrated harvest**.** The proposed integrated strategy for this program is based on WDFW's assessment of the genetic characteristics of the hatchery stock and local natural populations, the current and anticipated productivity of the habitat used by the populations, the potential for successfully implementing programs as integrated, and NOAA's final listing determinations (64 FR 14308, June 28, 2005). Modification of the proposed strategy may occur as additional information is collected and analyzed.

1.7) Purpose (Goal) of program.

Harvest

Besides releasing 1,000,000 fingerlings from the facility to provide for meaningful harvest opportunities (non-tribal and tribal), the Wallace Hatchery summer chinook fingerling program will continue to serve as a marked and tagged indicator stock to assess fishery impacts on wild and hatchery chinook and to estimate escapements of natural and hatchery-origin (NOR and HOR) chinook in the Snohomish basin.

Conservation

As per the Hatchery Scientific Review Group recommendation (Feb. 2002), the co-managers have refined a new plan to integrate, on average between 40 to 93.3% natural-origin chinook into the hatchery broodstock, corresponding to a range of 0.5 to 0.7 percent natural influence (PNI), in order to maintain genetic integration with the natural Snohomish River summer chinook population. These adults will come from the Wallace River Hatchery and the Sunset Falls fish trap on the upper South Fork Skykomish River (see sections 6.2.3 and 6.3 for more details on the development of a fully integrated hatchery program at the Wallace River Hatchery for their on-station chinook releases).

1.8) Justification for the program.

This program will be operated to provide fish for harvest and important population monitoring in marine and freshwaters while minimizing adverse genetic, demographic or ecological effects on listed fish. This will be accomplished in the following manner:

1) Juvenile chinook will be released as smolts to foster rapid migration time to saltwater thereby minimizing potential competition with and predation on listed fish.

2) Juvenile chinook will be released toward the end of the natural-origin chinook emigration time to minimize potential adverse interactions.

3) All juvenile chinook released will be acclimated at the hatchery facility, which is capable of trapping the majority of returning adults. This practice will minimize straying and make possible the removal or regulation of hatchery fish allowed to spawn naturally above the hatchery weir (trap).

4) All juvenile chinook will be marked to distinguish them from naturally spawning chinook. Of the 1,000,000 released, 600,000 are mass marked (adipose-fin clip only), 200,000 adipose-fin clip/coded-wire tagged (Ad + CWT) and 200,000 coded-wire tagged only, for use as a Double-Index Tag (DIT) group. Since all of the fish are either adipose-fin clipped or coded-wire tagged, they can provide NOR/HOR ratios on the spawning grounds in the Snohomish River watershed. The DIT is especially important and necessary to monitor the effects of mark-selective fisheries that are being implemented to reduce fishery impacts on ESA-listed salmon stocks. In addition, the DIT can provide data on catch contributions, run timing, total survival, migration patterns and straying into other watersheds as well as serve as an index for wild summer chinook.

5) Adult chinook produced from this program will be harvested at a rate that will allow for adequate escapement of listed chinook.

To minimize impacts on listed fish by WDFW facilities operation and the Wallace River Hatchery chinook fingerling program, the following Risk Aversions are included in this HGMP:

Table 1. Summary of risk aversion measures for the Wallace River Hatchery chinook fingerling program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.2	Surface water rights for Wallace River and May Creek are formalized through trust water right # S1-00109 and S1-05617, respectively. Monitoring and measurement of water usage is reported in monthly NPDES reports.
Intake Screening	4.2	The intake screens on the Wallace River and May Creek are not in compliance with current NOAA Fisheries screening criteria.
Effluent Discharge	4.2	This facility operates under the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System administered by the Washington Department of Ecology (DOE) - WAG 13 - 3006.
Broodstock Collection & Adult Passage	7.2, 2.2.3	The hatchery, located at the confluence of May Creek and the Wallace River, operates two adult weirs on both systems. Due to limited habitat, *Cryptobia* (parasite) problems and water quality problems, chinook are not allowed above the May Creek weir. Management of the Wallace River chinook broodstock includes a protocol for passage of fish above the Wallace River weir into approximately 3.8 miles of spawning habitat. Controlling the number of Hatchery-Origin Spawners (HOS) allowed into this area will increase the degree to which the fish produced from this are adapted to the natural environment. The co-managers have initially established a minimum seeding number of 400 spawners (200 pair of NORs) to be passed above the rack for natural spawning. These fish will be of natural-origin. If not available, hatchery-origin fish will be passed upstream to meet the 200 pair minimum seeding goal. The numbers were and will continue to be regulated or monitored to limit *Cryptobia* sp. problems at the hatchery and in consideration of potential genetic and ecological interactions with listed fish.
Disease Transmission	9.2.7	Co-Managers Fish Disease Policy. Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases.
Competition & Predation	2.2.3, 10.11	See sections 2.2.3 & 10.11

1.9) List of program "Performance Standards".

See section 1.10 below.

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

Benefits

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Assure that hatchery operations support Puget Sound Salmon Management Plan (US v Washington), the Shared Strategy for Salmon Recovery, production and harvest objectives.	Contribute to a meaningful harvest for sport, tribal and commercial fisheries. Achieve a 10-year average for smolt-to-adult survival of similar fingerling programs 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 needs.
Maintain outreach to enhance public understanding, participation and support of 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	A minimum of 500 (2,350) adults are collected throughout the spawning run in proportion to timing, age, and sex composition of return.	Annual run timing, age, and sex composition and return timing data are collected. Adhere to HSRG (2004) and WDFW spawning guidelines (WDFW 1983)
Region-wide, groups are marked in a manner consistent with information needs and protocols to estimate impacts to natural and hatchery-origin fish.	Used mass mark (adipose-fin clip only) since 2000BY for HOR/NOR differentiation with additional groups AD+CWT (200,000) and CWT only (200,000). This double index tag (DIT) serves as an index group for wild summer chinook as well as providing data on selective fishery impacts, catch contributions, run timing, total survival, migration patterns and potential straying into other watersheds.	Returning fish are sampled throughout their return for length, sex, mass marks and coded-wire tags.

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 Disease Policy (1998).	Necropsies of fish to assess health, nutritional status and culture conditions.	WDFW Fish Health Section inspects adult broodstock yearly for pathogens and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, WDFW's Fish Health Section recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as deemed necessary. A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.
	Release and/or transfer exams for pathogens and parasites.	1 to 6 weeks prior to transfer or release, fish are examined in accordance with the Co-Managers Fish Health Policy.
	Inspection of adult broodstock for pathogens and parasites.	At spawning, lots of 60 adult broodstock are examined for pathogens.
	Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens and parasites.	Control of specific fish pathogens through eggs/fish movements is conducted in accordance to Co-managers Fish Health Disease Policy.

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 (70 fish/lb) and released from the hatchery at a time that fosters rapid migration downstream. Mass mark and coded-wire tag production fish to identify them from naturally produced fish	As identified in the HGMP: Monitor size, number, date of release, mass mark quality and CWT retention. Additional WDFW projects: straying, in-stream evaluations of juvenile and adult behaviors, NOR/HOR ratio on the spawning grounds, fish health documented.
Artificial production facilities are operated in compliance with all applicable fish health guidelines, facility operation standards and protocols including HOPPS, Co-managers Fish Health Policy and drug usage mandates from the Federal Food and Drug Administration.	Hatchery goal is to prevent the introduction, amplification or spread of fish pathogens that might negatively affect the health of both hatchery and natural 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, if needed.
Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring.	NPDES permit compliance WDFW water right permit compliance	Flow and discharge reported in monthly NPDES reports.
Water withdrawals and in-stream water diversion structures for hatchery facility will not affect spawning behavior of natural populations or impact juveniles.	Hatchery intake structures meet state and federal guidelines where located in fish bearing streams.	All fish entering the hatchery are documented: Hatchery records. Visual observations recorded. Barrier and intake structure compliance assessed and needed fixes are prioritized.
Hatchery operations comply with ESA responsibilities.	WDFW completes an HGMP and is issued a federal and state permit when applicable.	Identified in HGMP and Biological Opinion for hatchery operations.
Harvest of hatchery-produced fish minimizes impact to wild populations.	Harvest is regulated to meet appropriate biological assessment criteria. Mass mark juvenile hatchery fish prior to release to enable state agencies to implement selective fisheries.	Agencies and tribes to provide up-to-date information needed to monitor harvests.

1.11) Expected size of program.

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

2,350 (55% male: 45% female) summer chinook are needed for the total program needs of 3.5 million eggs, which includes 1.8 million eyed eggs (or 2 million green eggs) for the Tulalip Tribe's chinook program. A range of 300-700 natural-origin broodstock (NOB) has been established to contribute to the hatchery broodstock for the Wallace River Hatchery program.

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

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling	Wallace River (07.0940)	1,000,000
Yearling		

* 1.8 million eyed eggs transferred to Tulalip Tribe for a 1.7 million release (elimination of fall chinook release in 2004).

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

Wallace River summer chinook fingerlings most recent coded-wire tagged group was 1985. The 1985 brood year survived at 0.10% (RMIS database). At this survival, the current program of 1,000,000 would produce 1000 adults.(more data forthcoming with more recent tagging of releases). A current agreement with the Tulalip Tribe will allow a double index group to be tagged (see section 10.7), which will provide an evaluation of the fingerling group.

Escapement levels back to the hatchery rack for broodyears 1995 through 2003 were 1,911, 2,254, 1,456, 1,514, 2,353, 4,928, 4,082, 3,558 and 5,687, respectively.

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

Program has been in operation for over 30 years.

1.14) Expected duration of program.

Ongoing

1.15) Watersheds targeted by program.

Snohomish River watershed - (WRIA 07)
-Skykomish River (07.0012)

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

An alternative action would be to reduce sub-yearling summer chinook release numbers at Wallace River Hatchery as a measure to decrease ecological risks to natural-origin chinook salmon. WDFW did not pursue this alternative because it does not meet fisheries enhancement objectives for the program, including treaty Indian fishing right entitlements (*US v. Washington*) and the Magnuson/Stevens Act for sustainable fisheries.

In order for any alternative actions to be considered for attaining program goals, the affected parties (co-managers) must approve any changes. The Puget Sound Salmon Management Plan (PSSMP), a federal court order, describes the co-management responsibilities of WDFW and the tribes with regard to fishery management and artificial production. The PSSMP explicitly states that "no change may be made to the Equilibrium Brood Document (program production goals) without prior agreement of the affected parties." In the Snohomish River watershed any changes in the production at the Wallace River Hatchery have to be reviewed and approved by WDFW and the Tulalip Tribes. There are agreements between WDFW and the Tulalip Tribes to mass mark chinook (MOU 2003) and to develop a summer chinook indicator stock for the Snohomish system. Production numbers and appropriate stocks to be used are also outlined in a Memorandum of Understanding (MOU) between the Tribes and WDFW (1997). The

SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.

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

During 2004-05, WDFW is writing HGMP's to cover all stock/programs produced at the Wallace River complex for authorization under the 4(d) rule of the ESA.

Harvest management of chinook populations within Puget Sound is implemented through the draft Puget Sound Comprehensive Chinook Management Plan (PSCCMP) - Harvest Management Component (Puget Sound Indian Tribes and WDFW, March 2004).

2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.

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

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

Chinook:

This program may potentially directly affect threatened populations of chinook salmon within the Puget Sound ESU, including Snoqualmie and Skykomish chinook.

Snohomish Basin Chinook populations:
1) The Snoqualmie chinook population spawns in the Snoqualmie River basin, which includes key spawning aggregations in the mainstem of the Snoqualmie River, the Tolt and Raging rivers, and Tokul Creek. It is considered to be a native stock and has been classified as “threatened” under the ESA.
2) The Skykomish chinook stock spawns in the Skykomish River basin, which includes the Pilchuck, Sultan, and Wallace rivers. Also included are the Woods and Elwell creeks, the North Fork of the Skykomish River up to Bear Creek (RM 13.1), and the South Fork of the Skykomish River, including Bridal Veil Creek. It is considered to be native and its stock status is classified as “threatened” under the ESA.

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

Skykomish Bull Trout:
1) A single stock that spawns in the south fork Skykomish River including West Cady Creek, Goblin Creek, Troublesome Creek, Salmon Creek and the east fork Foss Creek, tributaries to the south fork Skykomish River. This stock is considered to be a native stock that has been classified as "healthy" based on increasing escapement trends (draft SaSI, WDFW unpublished 2002).

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

Preliminary critical and viable population thresholds under ESA have been determined by the Co-managers (Puget Sound) Technical Review Team (PSTRT) to be at 1,745 and unknown, respectively for the Skykomish chinook stock (PSTRT 2003). For the Snoqualmie chinook stock, the critical population threshold as determined by the PSTRT is 521. NOAA Fisheries critical and viable thresholds are 1,650 and 3,500, respectively. SaSI designations are "unknown" and "depressed" for the Skykomish and Snoqualmie stocks, respectively.

- Provide the most recent 12-year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.

1.358:1 for 1990 to 1999.

- Provide the most recent 12-year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

Natural spawning chinook escapements in the Snohomish basin:

Year	Skykomish	Snoqualmie	Total
1991	2,192	628	2,820
1992	2,002	706	2,708
1993	1,653	2,366	4,019
1994	2,898	728	3,626
1995	2,791	385	3,176
1996	3,819	1,032	4,851
1997	2,355	1,937	4,292
1998	4,412	1,892	6,304
1999	3,455	1,344	4,799
2000	4,665	1,427	6,092
2001	4,575	3,589	8,164
2002	4,327	2,896	7,223
2003	3,474	1,977	5,451

Source: WDFW (Region 4, Chad Jackson)

- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

Percent HORs estimate straying into natural spawning areas (Source: K. Rawson Tulalip Tribe in B. Sanford, WDFW draft update for 2004 escapement)			
	Snoqualmie	Skykomish	Basin Total
1997	6.3	28.8	18.2
1998	28.0	66.1	54.7
1999	22.6	59.4	49.1
2000	12.5	62.0	50.4
2001	8.5	33.3	22.4
2002	14.6		
2003	17.4		
Average (97-03)	14.7	52.9	39.9

HORs – Hatchery-origin returns

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.

Smolt trap monitoring operations are ongoing in the Skykomish and Snoqualmie Rivers as well as fyke netting and beach seining studies in the Snohomish River estuary, nearshore marine areas, and pocket estuaries, and spawner surveys are conducted throughout the Snohomish basin. Take of listed chinook salmon will be possible effective with the 2005 return as all hatchery-origin chinook in the Snohomish region will be either coded-wire tagged, adipose fin clipped, otolith mass marked, or a combination of the above.

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

Broodstock Collection

Previously, natural-origin summer chinook may have entered the trap and been spawned with their unmarked hatchery counterparts. However, as of BY 2000, all Wallace River Hatchery fingerling production has been and will continue to be marked and tagged or both and can therefore be distinguished from natural-origin chinook (yearlings were 100% mass marked beginning with the 1998 BY).

Hatchery broodstock collection methods have been revised. As per the Hatchery Scientific Review Group recommendation (Feb. 2002), the Co-managers have refined a new plan to integrate, on average between 40% to 93.3% natural-origin chinook into the hatchery broodstock, corresponding to a range of 0.5 to 0.7 percent natural influence (PNI), in order to maintain genetic integration with the natural Snohomish River summer chinook population. The most recent proposal calls for an integration rate of 40%-93.3%

or 300-700 wild fish into the Wallace River Hatchery broodstock. These adults will come from the Wallace River Hatchery and the Sunset Falls fish trap on the upper South Fork Skykomish River (see sections 6.2.3 & 6.3 for more details).

The hatchery, located at the confluence of May Creek and the Wallace River operates two adult weirs on both systems. The May Creek weir is in place from June thru November each year. The Wallace River weir is in place from June through October each year. Previously, all chinook entering the Wallace River were diverted into adult holding ponds. The co-managers have developed a new protocol for Chinook passage above the Wallace River weir into approximately 3.8 miles of spawning habitat in the upper Wallace River and controlling the number of HOS allowed into this area to increase the degree to which the fish produced from this segment are adapted to the natural environment. The co-managers have established a minimum seeding number of 400 spawners (in the form of 200 NOR Chinook pairs) to be passed above the Wallace River rack for natural spawning. These fish will be of natural-origin if available; otherwise, hatchery-origin fish will be passed upstream to meet the 200 pair minimum seeding goal. Due to limited habitat, *Cryptobia* (parasite) problems and water quality problems, chinook are not allowed above the May Creek weir. The numbers were and will continue to be regulated or monitored to limit *Cryptobia* sp. problems at the hatchery and in consideration of potential genetic and ecological interactions with listed fish.

Disease Effects:
The risk of disease transmission to wild chinook in the area is low. Transmission of hatchery-origin diseases from the hatchery to wild fish in areas where they co-occur is an unlikely event. Although hatchery populations can be considered to be reservoirs for disease pathogens because of their elevated exposure to high rearing densities and stress, there is little evidence to suggest that diseases are routinely transmitted from hatchery to wild fish (Steward and Bjornn 1990). These impacts are addressed by rearing the chinook at lower densities, within widely recognized guidelines, continuing well-developed monitoring, diagnostic, and treatment programs already in place (Co-manager's Fish Health Policy 1998).

Predation/Competition:
The potential for predation is limited by the relative body size of fish released from the program and the size of prey. Generally, salmonid predators are thought to prey on fish approximately 1/3 or less their length (USFWS 1994), although coho salmon have been observed to consume juvenile chinook salmon of up to 46% of their total length (Pearsons et al. 1998). The lengths of juvenile migrant chinook salmon originating from natural production have been monitored in numerous watersheds throughout Puget Sound, including the Skagit River, Bear Creek, Cedar River, Green River (Seiler et al. 1998-2002), Stillaguamish River (Griffith et al. 2001; 2003), Skykomish River (Nelson and Rawson 2001; Nelson, Kelder and Rawson 2003; Nelson and Kelder 2005a and 2005b), Snoqualmie River (Nelson and Kelder 2002, 2004a, 2004b), Puyallup River (Samarin and Sabastian 2002), and Dungeness River (Marlowe et al. 2001). The average size of migrant chinook salmon is typically 40mm or less in February and March, but increases in the period from April through June as emergence is completed and growth

commences. The increasing length of natural origin juvenile chinook salmon from March through June indicates that delaying the release of hatchery smolts of a fixed size will reduce the risks associated with predation. Potential predation by Wallace River summer chinook fingerlings on naturally produced chinook in the Snohomish basin would be considered a low risk, as the fish are roughly the same size at out-migration and are not released until June each year. In a recent literature review of chinook salmon food habits and feeding ecology in Pacific Northwest marine waters, Buckley (1999) concluded that cannibalism and intra-generic predation by chinook salmon are rare events.

Collaborative studies between WDFW, the Tulalip Tribe and NOAA Fisheries have been underway over the past 4 years to study the ecological impacts of these summer chinook releases on other out-migrating salmonids in freshwater and in the estuarine and nearshore marine waters. Preliminary data and analysis indicates that releasing the fingerlings in June decreases any impacts since most of the natural-origin zero-age chinook have exited the system.

Genetic Effects:
The on-station summer chinook release program will be managed as a fully integrated hatchery program to reduce the risk of loss of fitness to the natural population due to hatchery fish spawning in the wild and to maintain genetic integration with the natural Snohomish/Skykomish summer chinook population.

- Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.

Precise numbers of HOR's and NOR's for some past years have been published (Rawson et al. 2001) whereas in other years, not all of the Wallace Hatchery chinook production was marked/tagged. However, as of the 2005 return, all (100%) of the Snohomish regional chinook hatchery production is identifiable by either adipose fin and otolith mass marking, coded-wire tagging, or a combination of the above.

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).

See "take" table at the end of the HGMP

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

The ability to assess listed adult chinook salmon takes has been improved through 100% marking of regional chinook releases via a combination of adipose-fin clip, otolith marking and coded-wire tagging of all hatchery-origin chinook in the Snohomish region (fingerling and yearling releases). This will allow ready differentiation between listed and non-listed chinook. On-going juvenile out-migrant trapping will continue to provide information regarding takes occurring as a result of hatchery production. If identified listed chinook salmon take levels exceed expected authorized levels, WDFW will consult with NOAA Fisheries in a timely manner.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

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

The Wallace River Hatchery fingerling summer chinook salmon HGMP is included as one of 29 WDFW-managed plans under the co-managers' Resource Management Plan (RMP) for Puget Sound region chinook salmon hatcheries. This HGMP is in alignment with the RMP, which serves as the overarching comprehensive plan for state and tribal chinook salmon hatchery operations in the region.

As affirmed in the co-managers' RMP, WDFW hatchery programs in Puget Sound must 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 hatchery operations:

Genetic Manual and Guidelines for Pacific Salmon Hatcheries in Washington. These guidelines define practices that promote maintenance of genetic variability in propagated salmon (Hershberger and Iwamoto 1981).

Spawning Guidelines for Washington Department of Fisheries Hatcheries. Assembled to complement the above genetics manual, these guidelines define spawning criteria to be use to maintain genetic variability within the hatchery populations (Seidel 1983).

Hatchery Reform- Principles and Recommendations of the Hatchery Scientific Review Group. This report provides a detailed description of the HSRG's scientific framework, tools and resources developed for evaluating hatchery programs, the processes used to apply these tools, and the resulting principles, system-wide recommendations, and program-specific recommendations to reform (HSRG 2004).

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 (WDFW 1991).

Fish Health Policy of the Co-managers of Washington State. This policy designates zones limiting the spread of fish pathogens between watersheds, thereby further limiting the transfer of eggs and fish in Puget Sound that are not indigenous to the regions (WDFW, NWIFC, WSFWS 1998).

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.

In 1999, several PS and coastal stocks were listed as threatened under the federal Endangered Species Act (ESA). State, tribal and federal managers need to ensure that their hatcheries do not present a risk to listed species. Through this HGMP and hatchery reform efforts, the Co-managers have sought to go beyond merely complying with ESA directives. The new approach is to reform hatchery programs to provide benefits to wild salmon recovery and sustainable fisheries. Hatchery management decisions are being be based on system-wide, scientific recommendations, providing an important model that can be replicated in other areas.

In addition, the Legislature, in 1999, created the Salmon Recovery Funding Board (SRFB) and the Shared Strategy for Salmon Recovery. Both are collaborative efforts to protect and restore salmon runs across Puget Sound. They bring together the experience and viewpoints of citizens, major state and federal natural resource agencies, local governments, non-government organizations and Puget Sound Tribes. The SRFB provides grant funds to protect or restore salmon habitat and assist related activities that produce sustainable and measurable benefits for fish and their habitat. The Shared Strategy process helps identify what is needed in each watershed to recover salmon habitat through a watershed recovery plan (see section 3.4 for more details).

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

There are agreements between WDFW and the Tulalip Tribes to mass mark chinook (MOU 2003) and to develop a summer chinook indicator stock for the Snohomish system. Production numbers and appropriate stocks to be used are also outlined in a Memorandum of Understanding (MOU) between the Tribes and WDFW (1997). The parties are updating their agreements, which are about to be signed by the parties in 2005, to continue joint hatchery operations and to continue mass marking.

This hatchery program, and all other WDFW anadromous salmon hatchery programs within the Puget Sound Chinook ESU, operates under *U.S v Washington* that provides the legal framework for coordinating these programs, defining artificial production objectives, and maintaining treaty-fishing rights through the court-ordered Puget Sound Salmon Management Plan (PSSMP) (1985). This co-management process requires that both the State of Washington and the relevant Puget Sound Tribe(s) develop *Equilibrium Broodstock Programs* and enter into agreement the function, purpose and release strategies of all hatchery programs. Two documents are completed each year, describing agreed hatchery fish production levels for each brood year. The "Future Brood Document" is a detailed listing of agreed annual juvenile fish production goals. This document is reviewed and updated each spring, and finalized in July. The "Current Brood Document" presents actual juvenile fish production levels relative to the annual production goals. This second document is developed in the spring after eggs spawned that year have been enumerated and actual resultant juvenile fish production levels can be

estimated. Through this process, the co-managers document their agreement on the function, purpose and release strategies for all Puget Sound region hatchery programs.

3.3) Relationship to harvest objectives.

The Co-managers are following a harvest management plan for Puget Sound chinook salmon. The NOAA Fisheries Division has issued a biological opinion for salmon fisheries within Puget Sound conducted between May 1, 2000 and April 30, 2003 concluding that these fisheries do not create jeopardy to listed Puget Sound chinook salmon. The Co-managers recently submitted a plan for fisheries to be conducted between May 1, 2003 and April 30, 2009 for consideration by NOAA Fisheries. All operations of the Wallace River Hatchery are consistent with the above plans.

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.

Program fish contribute to the Washington State marine sport and commercial fisheries as well as the Tribal net fishery and WDFW in-river sport fishery. No complete CWT recovery data is available at this time. WDFW opens a recreational hook and line, selective (mark) chinook fishery, three days a week. The Tulalip Tribe opens a net fishery for Tribal members for three days also. Tribal and State catches for the past 12 years are as follows:

Year	Area 8D (Net)	Area 8D (Sport)
1988	1,405	*
1989	2,438	*
1990	4,220	*
1991	4,001	*
1992	3,102	*
1993	3,714	*
1994	4,688	1,404
1995	8,013	2,279
1996	11,386	2,791
1997	8,376	2,902
1998	7,125	*
1999	15,368	511
2000	7,663	1,192
2001	6,062	1,708
2002	5,465	865 (preliminary)
2003	8,903	**

* - No Tulalip special area selective fishery
** - Estimates not yet available

3.4) Relationship to habitat protection and recovery strategies.

The Legislature, in 1999, created the Salmon Recovery Funding Board (SRFB) and, as indicated earlier, the Shared Strategy for Salmon Recovery. Both are collaborative efforts to protect and restore salmon runs across Puget Sound. They bring together the experience and viewpoints of citizens, major state and federal natural resource agencies, local governments, non-government organizations and Puget Sound Tribes. The SRFB provides grant funds to protect or restore salmon habitat and assist related activities that produce sustainable and measurable benefits for fish and their habitat. The Shared Strategy process helps identify what is needed in each watershed to recover salmon habitat through a watershed recovery plan.

Shared Strategy

The Shared Strategy is based on the conviction that:
1) people in Puget Sound have the creativity, knowledge, and motivation to find lasting solutions to complex ecological, economic, and cultural challenges;
2) watershed groups that represent diverse communities are essential to the success of salmon recovery;
3) effective stewardship occurs only when all levels of government coordinate their efforts;
4) the health and vitality of Puget Sound depends on timely planning for ecosystem health and strong local and regional economies; and
5) the health of salmon are an indicator of the health of our region salmon recovery will benefit both human and natural communities.
The 5-Step Shared Strategy
1) identify what should be in a recovery plan and assess how current efforts can support the plan.
2) set recovery targets and ranges for each watershed.
3) identify actions needed at the watershed level to meet targets.
4) determine if identified actions add up to recovery. If not, identify needed adjustments.
5) finalize the plan and actions and commitment necessary for successful implementation.

Salmon Recovery Funding Board

Composed of five citizens appointed by the Governor and five state agency directors, the Board provides grant funds to protect or restore salmon habitat and assist related activities. It works closely with local watershed groups known as lead entities (see below). SRFB has helped finance over 500 projects. The Board supports salmon recovery by funding habitat protection and restoration projects. It also supports related programs and activities that produce sustainable and measurable benefits for fish and their habitat.

Lead Entities

Lead entities are voluntary organizations under contract with the Washington State Department of Fish and Wildlife (WDFW). Lead entities define their geographic scope and are encouraged to largely match watershed boundaries.

Lead entities are essential in ensuring the best projects are proposed to the Board for funding in its annual grant process.
All lead entities have a set of technical experts that assist in development of strategies, and identification and prioritization of projects. The lead entity citizen committee is responsible under state law for developing the final prioritized project list and submitting it to the SRFB for funding consideration. Lead entity technical experts and citizen committees perform important unique and complementary roles. Local technical experts are often the most knowledgeable about watershed, habitat and fish conditions. Their expertise is invaluable to ensure priorities and projects are based on ecological conditions and processes. They also can be the best judges of the technical merits and certainty of project technical success. Citizen committees are critical to ensure that priorities and projects have the necessary community support for success. They are often the best judges of current levels of community interests in salmon recovery and how to increase community support over time with the implementation of habitat projects. The complementary roles of both lead entity technical experts and citizen committees is essential to ensure the best projects are proposed for salmon recovery and that the projects will increase the technical and community support for an expanded and ever increasing effectiveness of lead entities at the local and regional level. (http://www.iac.wa.gov/srfb/leadentities.htm).

Work groups, including the Snohomish County Lead Entity, are currently in the process of assessing the major factors limiting (Limiting Factors Analysis) natural salmon production and are developing habitat management plans to facilitate chinook salmon recovery. Initial recommendations for the Snohomish basin are described in the *Initial Snohomish River Basin Chinook Salmon Conservation/Recovery Technical Work Plan (1999).*

3.5) Ecological interactions.

(1) Salmonid and non-salmonid fishes or other species that could negatively impact the program.

Negative impacts by fishes and other species on the Wallace River Hatchery fingerling chinook program could occur directly through predation on program fish, or indirectly through food resource competition, genetic effects, or other ecological interactions. In particular, fishes and other species could negatively impact Wallace River Hatchery chinook survival rates through predation on newly released, emigrating juvenile fish in freshwater, estuarine and marine areas. Certain avian and mammalian species may also prey on juvenile chinook while the fish are rearing at the hatchery site, if these species are not excluded from the rearing areas. Species that could potentially negatively impact juvenile chinook through predation include the following:

- Avian predators, including mergansers, cormorants, belted kingfishers, great blue herons, and night herons
- Mammalian predators, including mink, river otters, harbor seals, and sea lions
- Cutthroat trout

Rearing and migrating juvenile and adult chinook originating through the program may also serve as prey for large, mammalian predators in nearshore marine areas, the estuary and in freshwater areas downstream of the hatchery in the Snohomish River watershed to the detriment of population abundance and the program's success in augmenting harvest. Species that may negatively impact program fish through predation may include:

- Orcas
- Sea lions
- Harbor seals
- River otters

(2) Salmonid and non-salmonid fishes or other species that could be negatively impacted by the program (focus is on listed and candidate salmonid species).

- Chinook
- Bull trout

(*3) Salmonid and non-salmonid fishes or other species that could positively impact the program*.

Fish species that could positively impact the program may include other salmonid species and trout present in the Skykomish River watershed through natural and hatchery production. Juvenile fish of these species may serve as prey items for the chinook during their downstream migration in freshwater and into the marine area. Decaying carcasses of spawned adult fish may contribute nutrients that increase productivity in the watershed, providing food resources for the emigrating chinook. Salmonid adults that return to the Snohomish Basin and any seeding efforts using adult salmon carcasses may provide a source of nutrients 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 salmon have been found to elevate stream productivity through several pathways, including: 1) the releases of nutrients from decaying carcasses has been observed to stimulate primary productivity (Wipfli et al. 1998); 2) the decaying carcasses have been found to enrich the food base of aquatic invertebrates (Mathisen et al. 1988); and 3) juvenile salmonids have been observed to feed directly on the carcasses (Bilby et al. 1996). Addition of nutrients has been observed to increase the production of salmonids (Slaney and Ward 1993; Slaney et al. 2003; Ward et al. 2003).

(4) Salmonid and non-salmonid fishes or other species that could be positively impacted by the program.

The chinook program could positively impact freshwater and marine fish species that prey on juvenile fish. Nutrients provided by decaying chinook carcasses might also benefit fish in freshwater. These species include:

- Northern pikeminnow
- Coho salmon
- Cutthroat trout
- Steelhead
- Pacific staghorn sculpin
- Numerous marine pelagic fish species

SECTION 4. WATER SOURCE

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

The Wallace River and May Creek are the two sources of water used for incubating and rearing summer chinook at Wallace River Hatchery. Both of these are surface water in origin. Both sources exhibit similar temperature profiles ranging from the mid 30Es to the upper 60Es F. They are small streams that are subject to rapid changes in flow and height especially during the winter flood months. Water for the hatchery is pumped from both sources: The Wallace River can provide as much as 12,000 gallons per minute (gpm) and 5,800 gpm is available from May Creek.

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.

The facility has two water intake structures, one on May Creek the other on the Wallace River. Chinook adults are not passed above the May Creek intake. The intake screens on the Wallace River (screens have recently been replaced) and May Creek are in compliance with NOAA Fisheries screening criteria (NMFS 1995-1996). However the intake structures are not in compliance with the current NOAA intake criteria. Chinook adults are passed above the Wallace River intake. For the Wallace River, the water right # is S1-00109 and for May Creek the # is S1-05617. The facility is covered under NPDES permit # WAG 13-3006. As per the recommendations of the Hatchery Scientific Review Group (HSRG), steps have been undertaken to improve the pollution abatement system further. WDFW has contracted with a vendor to evaluate and design a new abatement system. The vendor is approaching the 35% design completion point (February, 2005). Additional funding will be required to construct the new system.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

The Wallace River Hatchery has two adult collection facilities. The first is an in-stream trap located on May Creek. The trap measures 70' at its widest point and is 110'. in length. There are two step-type ladders located on the lower end of the trap and a picket-type rack located at the upper end of the pond. The trap is dependent on the natural flow of May Creek for its water supply. The second trapping facility consists of a series of 3 100' X 20' X 6' adult capture ponds. A weir is placed across the Wallace River the first week in June and remains in place until October 1st each year. This is done to encourage chinook migration up the Denil-style fish ladder that supplies the adult ponds. Adults are also passed above the weir for natural spawning, as previously described. Water is pumped from the Wallace River to supply inflow to these adult-holding ponds. After the adult capture season ends (in December each year) these ponds are populated with yearling coho, which remain until their release in May annually.

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

No chinook are transported off-station at this time. Summer chinook from the Sunset Falls trap are transported under oxygen at low density in a standard fish hauling truck for approximately 0.5 hours to the Wallace River Hatchery.

5.3) Broodstock holding and spawning facilities.

Summer chinook broodstock are held in three different adult capture raceways, based upon their return timing, until they become sexually mature and are removed for spawning. Spawning facilities are located at the ends of these raceways.

5.4) Incubation facilities.

The incubation facility at Wallace River consists of 1,152 "Heath" style vertical incubators. These incubators are supplied with 4 gpm of water from May Creek.

5.5) Rearing facilities.

There are three types of rearing vessels used at Wallace River: 6 - 100' X 10'X 4' raceways, 4 - 80' X 20' X 4' standard ponds and 3 – 1,000' X 28' X 5' rearing channels. Typically, chinook fry are ponded in either the raceways or standard ponds and reared until they reach 400 fish per pound (fpp). At this point the fish are transferred to the rearing channels for the rest of the rearing period and eventual release. The program goal for release size and timing is to release the sub-yearling during the first week of June at a target size of 70 fpp.

5.6) Acclimation/release facilities.

Fish are acclimated on May Creek and/or Wallace River water their entire time in the hatchery. See section 5.5

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

Because surface water is the source for the hatchery, the threats from waterborne bacteria, viruses and parasites present the most significant threat to fish health. Additionally, electrical power is required to supply water to the ponds and, therefore, the loss of power also presents a potential threat to fish health.

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.

The Wallace River Hatchery is staffed with five full time employees, one of which is on standby status 24 hours a day, seven days a week. All staff is very familiar with the workings of the hatchery and has received training in fish cultural techniques and fish pathogen detection, diagnosis, and control and prevention strategies. Additionally, WDFW fish health staff makes frequent visits to the hatchery to check the health of fish stocks and are available immediately in case of a disease outbreak. The hatchery is equipped with a sophisticated alarm system that monitors pond levels and other conditions that are critical to hatchery operations. There is a standby power generator capable of supplying all of the electrical needs of the hatchery in case of a loss of power.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.

In the past, chinook returning to the hatchery before mid- to late August were assumed to be summer chinook and after September 1st as fall chinook. These dates shifted somewhat from year to year depending on run timing, which in turn was believed affected by marine and river harvest patterns, river flows and possibly other factors. The expectation now is that since all fall chinook (primarily of Green River stock origin) releases from the facility were completely discontinued after broodyear 1996 and all hatchery chinook released on-station after this were either mass marked and/or coded-wire tagged denoting their Skykomish summer chinook stock origin, all marked/tagged hatchery returns in the future will be of summer chinook origin. This will reduce the possibility of deleterious genetic effects on the native summer chinook populations in the Snohomish basin that might result from straying and subsequent genetic introgression. The current DNA composition of all hatchery and natural chinook in the Snohomish basin is being analyzed. The genetic compositions of returns to the hatchery are being analyzed by return timing and by their hatchery vs. natural origins.

6.2) Supporting information.

6.2.1) History.

The Wallace River Hatchery summer chinook stock was originally recruited from native Skykomish River summer chinook that returned to the fish passage facility at Sunset Falls on the Skykomish River in the early 1970s. Since that time, the only source of summer chinook eggs has been adult fish that return to the traps at the Wallace River Hatchery (see section 6.1 above). There is a considerable history of introductions of out-of-basin stocks into the Snohomish system, however, that program was discontinued, effective with brood year 1997. Nearly all introductions were of Green River fall chinook origin.

6.2.2) Annual size.

2,350 adult summer chinook (55%: 45% male: female) are needed for this program, which includes the fingerling and yearling programs at Wallace River as well as to supply eggs for the cooperative chinook enhancement program with the Tulalip Tribe (1.8 million eyed eggs).

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

The Wallace Hatchery Summer Chinook program was initiated with indigenous summer chinook broodstock captured at the Sunset Falls trap, located on the Skykomish River. Past levels of natural Skykomish River broodstock returning to the hatchery and incorporated into the hatchery population are unknown. With the beginning of mass marking (1998 BY for yearlings and 2000 BY for fingerlings), otolith marking and coded-wire tagging, 100% of returning hatchery fish from the Snohomish region will be identifiable with one or a combination of these marking and tagging methods.

As per the Hatchery Scientific Review Group recommendation (Feb. 2002), the Co-managers have refined a new plan to integrate, on average between 40 to 93.3% natural-origin chinook into the hatchery broodstock, corresponding to a range of 0.5 to 0.7 percent natural influence (PNI), in order to maintain genetic integration with the natural Snohomish River summer chinook population. The most recent proposal calls for an integration rate of 40%-93.3% or 300-700 wild fish into the Wallace River Hatchery broodstock. This integration will be accomplished by infusing natural-origin chinook at a level equal to or greater than the proportion of hatchery-origin chinook that spawn in the wild in the Skykomish system. The collection of natural-origin chinook for this program will come from only two components of the Skykomish population: the Wallace River and from the Sunset Falls fish trap on the upper South Fork Skykomish River.
As mentioned above, a range of 300-700 natural-origin broodstock (NOB) has been established to contribute to the hatchery broodstock at Wallace River Hatchery. This range is based on the theoretical concept of the proportion of natural influence (PNI; from AHA model), which compares the natural-origin contribution to the hatchery broodstock with the hatchery-origin contribution to the natural spawning population (Ford 2002). The HSRG recommends a minimum PNI of 0.5, but to work towards a PNI of 0.7. Based on a need for 750 effective spawners for the Wallace River chinook on-station release, assuming a 40% average contribution of Wallace River Hatchery fish to the Skykomish natural spawning population (Rawson, Kraemer, and Volk 2001, and subsequent analyses), and using the definition of PNI, the range of 300-700 for NOB will results in NOB proportions ranging from 40% to 93.3%, corresponding to a range of 0.5 to 0.7 for PNI.

6.2.4) Genetic or ecological differences.

Since the Wallace River hatchery population was founded with native summer chinook salmon broodstock, the genetic composition of hatchery- and natural-origin summer chinook in the Skykomish River are closely related. Marshall (WDFW, memo May 30,1997) found no significant differences between natural and hatchery Skykomish River summer chinook. The current DNA composition of all hatchery and natural chinook in the Snohomish basin is being analyzed. The genetic compositions of returns to the hatchery are being analyzed by return timing and by their hatchery vs. natural origins.

6.2.5) Reasons for choosing.

As with many salmon hatcheries in Washington State, the Green River-origin fall chinook stock had been propagated at the Wallace River Hatchery for many years. To reduce the potential for adverse genetic and ecological interactions affecting naturally-produced chinook in the Snohomish drainage, the decision was made to eliminate the fall chinook production. Effective with the 1997 brood return, the stock was replaced with a more appropriate stock at Wallace River Hatchery; the indigenous summer chinook originally collected at the Sunset Falls fish trap on the upper South Fork Skykomish River.

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.

All summer chinook fingerlings produced at the Wallace River facility are mass marked (adipose -fin clip only), coded-wire tagged, or both, as part of a Double-Index Tag (DIT) program. Fingerling chinook from the Tulalip Hatchery, the only other chinook hatchery program in the Snohomish region, are 100% otolith marked, adipose-fin clipped, and a portion coded-wire tagged. This combination of identification allows for 100% of the regional chinook hatchery return to be identified. As per the Hatchery Scientific Review Group recommendation (Feb. 2002), the Co-managers have refined a new plan to integrate, on average 40% to 93.3% natural-origin chinook into the hatchery broodstock in order to maintain genetic integration with the natural Snohomish River summer chinook population. The most recent proposal calls for an integration rate of 40% or 300-700 wild fish into the Wallace River Hatchery broodstock. These adults will come from the Wallace River Hatchery and the Sunset Falls fish trap on the upper South Fork Skykomish River. The fall chinook program has been eliminated.

As mentioned in section 6.2.3 and above, the on-station summer chinook release program will be managed as a fully integrated hatchery program to reduce the risk of loss of fitness to the natural population due to hatchery fish spawning in the wild. Potential impact to the Skykomish population will be limited because naturally-spawning chinook from these two sub-basins together comprise only approximately 15% of the potential spawning of the Skykomish population under current conditions, thus leaving the great majority of the current natural spawning capacity invulnerable to this broodstock collection. Also, natural-origin chinook returning to the Wallace River weir (as distinguished from those that spawn in natural spawning areas) have not been included in natural escapement estimates in the past and therefore will not impact natural escapement.

Furthermore, the co-managers have established strict guidelines for collection of natural-origin chinook from the Sunset Falls facility, designed so that the productivity of the upper South Fork Skykomish River will not be impaired. Those protocols for collection of NOB from the Sunset Falls trap and Wallace River weir are the following:

1. Take 20% of natural-origin chinook arriving at Sunset Falls trap throughout their return timing. The maximum transfer of 20% of the Sunset Falls trap return from the NOS to the NOB category is a conservative guideline designed to limit the effect of taking natural-origin fish into the hatchery. The co-managers evaluated this guideline in two ways. First, an analysis of past return data revealed that if the 20% removal was applied to the observed chinook numbers that have passed over Sunset Falls in the recent 20-year period, it would have resulted in a range of 346 to 929 NOS in the upper South Fork Skykomish (see table below in this section). The lower end of this range is still greater than the maximum sustainable yield escapement for this area from current conditions using EDT analysis (see table below).

   Thus, we expect that under this protocol, the MSY escapement level for the upper South Fork Skykomish would be exceeded the great majority of the time. The co-managers also used a very simple simulation model to project the NOS above Sunset Falls if this protocol were in place, assuming that the population dynamics of this area operated according to the Beaverton-Holt spawner-recruit parameters estimated in the EDT analysis (see table below). This analysis suggested that the NOS above Sunset Falls would equilibrate at approximately 860, well above the current conditions MSY escapement level of 332 and in the top quarter of the past 20 years of observation.

   It is also important to note that if, in any year, either pre-season or in-season run size information indicates that the critical escapement level for the Skykomish population will not be reached, the broodstocking protocol will be modified to assure that the collection of NOB from Wallace River and Sunset Falls will not cause the NOS to go below the critical level.

2a. If this available number of natural-origin chinook from Sunset Falls is less than 150, take sufficient natural-origin chinook from Wallace River weir to make 300 NOB (the ratio of Wallace: Sunset, when Sunset NOB < 150, may exceed 1.0 in these instances of low NOB abundances).
2b. If this number is greater than 150, then take an equal number of NOB from Wallace River (the ratio of Wallace: Sunset, when Sunset NOB > 150, will not exceed 1.0)
Note: In 2a and 2b, if there are not sufficient NOB from Wallace River to make the minimum 300 NOB, then the total NOB in that year will be the number taken from Sunset Falls plus the total available from Wallace. Additional chinook needed for broodstock will be of hatchery-origin, taken from the Wallace River rack.
3. If at any time, the total expected natural-origin spawners (NOS) for the Skykomish population is less than the critical escapement level defined in the chinook harvest management plan, then the above will be re-adjusted to assure that the NOS will exceed the critical escapement.
Below is the number of chinook passed at Sunset Falls and numbers that would have been passed if 20% were removed; 1993-2004

Year	Chinook Passed	NOS if 20% Removed
1993	630	504
1994	531	425
1995	1,035	828
1996	860	688
1997	699	559
1998	572	458
1999	722	578
2000	790	632
2001	1,161	929
2002	942	754
2003	889	711
2004	716	573

Results of EDT analysis on components of Skykomish population.

Population	Scenario	Diversity index	Productivity	Capacity	Eq. Abundance	MSY Esc
Upper SF Skykomish	Current conditions	89%	5.8	1,366	1,131	332
	Historic potential	100%	13.4	3,659	3,386	726
Upper Wallace	Current conditions	100%	7.2	309	266	72
	Historic potential	100%	18.3	1,006	951	180
Remainder of Skykomish	Current conditions	77%	3.7	10,132	7,400	2,529
	Historic potential	99%	14.5	48,750	45,397	9,432
Entire Skykomish Population	Current conditions	85%	4.4	11,692	9,013	2,918
	Historic potential	100%	16.0	50,983	47,806	9,550

SECTION 7. BROODSTOCK COLLECTION

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

Adults.

7.2) Collection or sampling design.

Adult traps are operated on May Creek and the Wallace River starting each year on the first of June for the purpose of collecting summer chinook broodstock. Trapping and collection efforts will continue over the return timing for the hatchery-marked and/or tagged summer chinook each year. There are racks associated with each trap that span the width of the river or creek. Trapping efficiency is very much dependent on water flow. In low flow years the fish are much more reluctant to enter the traps and are more likely to spawn naturally below the hatchery.

During 2001-2002, trapping for summer chinook took place from June 1 to August 15th to reduce the possibility that fall chinook adults would also be captured and included in the summer chinook broodstock pool. Adults entering the trap during that period in excess to egg needs, or adults returning subsequent to the August 15th were returned to the river to spawn naturally. Tulalip Hatchery summer chinook egg requirements in 2001-2003 were also met from adults returning to the hatchery from June 1 to August 15.

See section 6.2.3 and 6.3 for more information on the proposal to fully integrate the Wallace River Hatchery on-station release program and for collection of adults from the Sunset Falls trap facility.

7.3) Identity.

All adult hatchery chinook will be adipose-fin clipped and/or coded-wire tagged and will be of summer chinook origin.

7.4) Proposed number to be collected:

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

A total of 2,350 adults (55%: 45% male: female) are needed to support the summer chinook fingerling and yearling program at Wallace River and to fulfill the egg transfer to the Tulalip Tribe.

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

Year	Adults			Eggs	Juveniles
	Females	Males	Jacks		
1992	188	217	48	736,000	
1993	309	401	45	1,196,000	
1994	99	140	12	399,000	
1995	337	231	21	1,430,000	
1996	417	430	9	1,915,000	
1997	396	331	13	1,695,000	
1998	319	367		1,264,500	
1999	403	404		1,685,000	
2000	409	304	1	2,045,000	
2001	329	331		1,420,000	
2002	475	492	6	2,114,000	
2003	732	736	6	3,604,300	

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

Hatchery-origin chinook returning to the Wallace River Hatchery in excess of broodstock needs will be utilized either as fish passed upstream for natural spawning (in the case there is insufficient natural-origin broodstock (NOB) or they will be designated as surplus. The minimum number of fish to be passed upstream is 400 spawners, in the form of 200 pairs. If there are enough NOBs, no hatchery-origin chinook will be passed above the weir.

7.6) Fish transportation and holding methods.

There is no transportation of adult chinook at this facility. All adults are held in 3 - 100' X 20' X 6' adult ponds. Virtually all of the fish arrive at the hatchery "green" and must be held as long as 110 days, until "ripe". During this time they are treated with antibiotics for the control of disease and with formalin to resist the growth of parasites and fungus. Summer chinook from the Sunset Falls trap are transported under oxygen at low density in a standard fish hauling truck for approximately 0.5 hours to the Wallace River Hatchery.

7.7) Describe fish health maintenance and sanitation procedures applied.

See section 7.6. Extensive use of iodophore disinfectant is used to minimize contaminants and the spread of disease during spawning procedures. Pre-spawning adults are inoculated with antibiotics to minimize the possible spread of disease (bacterial kidney disease). Formalin is used to control parasites and fungal growth on adult fish. Additionally, all female adults are sampled for the presence of bacterial kidney disease.

7.8) Disposition of carcasses.

Spawned and un-spawned carcasses that have not been exposed to antibiotics or chemical treatment are typically sold to a fish buyer; otherwise, all carcasses are buried on station.

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

See section 7.2. To minimize the potential for adverse genetic effects to listed natural fish from, for example, straying and spawning with their wild counterparts, the broodstock source at the Wallace River facility and at Tulalip was changed from non-native stock to indigenous Skykomish River summer chinook. As per the Hatchery Scientific Review Group recommendation (Feb. 2002), the co-managers have refined a plan to integrate, on average of 40% to 93.3% natural-origin chinook into the hatchery broodstock in order to maintain genetic integration with the natural Snohomish River summer chinook population. The most recent proposal calls for an integration rate of 40% to 93.3% or 300-700 wild fish into the Wallace River Hatchery broodstock. These adults will come from the Wallace River Hatchery and the Sunset Falls fish trap on the upper South Fork Skykomish River.

See section 6.2.3 and 6.3 for more details on the selection and collection of broodstock and the proposal to fully integrate the on-station release program.

SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1) Selection method.

The intent of the Wallace River Hatchery on-station release program will be to select randomly over the entire run time marked and unmarked chinook; however, any proportion of ripe fish encountered will determine that days selection process.

8.2) Males.

No back-up males or repeat spawners are used. Jacks are spawned at a rate of 2% over the spawning season

8.3) Fertilization.

Beginning with 2003 broodyear, a five-by-five matrix spawning protocol (effective sex ratio 1:1) was adopted at the Wallace River Hatchery to maximize the effective population size.

8.4) Cryopreserved gametes.

Not applicable

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 potential for adverse ecological effects to listed natural fish during mating can be eliminated or greatly reduced by integrating natural-origin chinook during the mating scheme. As per the Hatchery Scientific Review Group recommendation (Feb. 2002), the Co-managers have refined a plan to integrate, on average of 40% to 93.3% natural-origin chinook into the hatchery broodstock in order to maintain genetic integration with the natural Snohomish River summer chinook population. The most recent proposal calls for an integration rate of 40% to 93.3% or 300-700 wild fish into the Wallace River Hatchery broodstock. These adults will come from the Wallace River Hatchery and the Sunset Falls fish trap on the upper South Fork Skykomish River.

See section 6.2.3 and 6.3 for more details on the selection, collection and mating of broodstock and the proposal to fully integrate the on-station release program.

SECTION 9. INCUBATION AND REARING -

Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1 Incubation:

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

The on-station egg take goal is 1,500,000 eggs for both sub-yearling and yearling programs, and an additional 1.8 million eyed eggs for the Tulalip Tribe program. Green egg to fry survival averaged 94.7 % for broodyears 1998 through 2002 (WDFW Hatchery Records, Wallace River Hatchery).

9.1.2) Cause for, and disposition of surplus egg takes.

Current management approaches do not allow for the taking of eggs in surplus of program goals. If hatchery losses exceed the expected levels, then program goals for release are not met.

9.1.3) Loading densities applied during incubation.

Wallace River summer chinook eggs average 1,450 per pound. They are placed in Heath style incubators at a loading of 6,000 eggs per tray. Each half-stack (8 trays) receives 4 gpm of inflow.

9.1.4) Incubation conditions.

Temperature of inflowing water is monitored and recorded daily. Dissolved oxygen is checked on an infrequent basis and silt management is accomplished by "rodding" the trays and brushing tray screens. Since this is a surface water source, siltation is dealt with on a frequent basis and during flood events the incubators sometimes need constant attention.

9.1.5) Ponding.

A kd index of 1.97 - 2.00 is used as the criteria for initial ponding of fry. Ponding typically occurs from mid-December to mid-January each year. All ponding of fry is forced.

9.1.6) Fish health maintenance and monitoring.

All incubators are subject to a daily 15-minute drip treatment of formalin (1,667 ppm) for the control of fungus and disease. These treatments start 2 days after initial fertilization and continue until approximately 1 week prior to hatching. At the "eyed" stage, the eggs are removed from the trays and shocked. All non-viable eggs are then removed by either an automated egg picker or by hand.

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.

Chinook eggs retained in the Heath stacks are held at relatively low loading densities, siltation of eggs are closely monitored, mortality due to fungus infection is controlled and water temperatures and dissolved oxygen levels are monitored. All of these actions help reduce the likelihood for adverse genetic and ecological effects to listed fish occurring during incubation.

9.2) <u>Rearing</u>:

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 (1988-99), or for years dependable data are available..

The average survival for broodyears 1998-2002 for fry to smolt was 92%.

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

Numerous criteria are applied depending on the fish's size, the pond style they reside in, water quality, water flow, water temperature, relative health and other water conditions. However, as a rule, the criteria limit loadings to a maximum of 3 pounds fish/gpm of inflow until they have reached a size of 100 fpp.

9.2.3) Fish rearing conditions

Water temperatures are monitored on a daily basis. Water flows are checked at least weekly. Each pond is monitored for loss and all mortalities are picked daily. Ponds are vacuumed on an as-needed basis (typically weekly). Fish Health staff on a biweekly basis monitors the general health of the fish.

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.

Routine sampling of fish occurs on a weekly basis until the fish reach a size of 100 fpp. At this time, sampling is reduced to a biweekly schedule. The fish are sampled for weight, length, condition factor and coefficient of variance.

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

Size data have been collected, but monthly growth rates in the hatchery vary among years depending on factors such as ambient water temperatures, age of fish, rearing densities and other factors.

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*).

Salmon starter mash, crumbles and pellets formulated by Scredding (formerly Moore-Clark) and BioOregon are used to feed Wallace River summer chinook. The feed used are "dry" or "semi-dry". The daily percentage of body weight fed varies depending on the size of the fish, temperature of the water and time of year. However, the range is usually from 1-3% B.W./day. Overall food conversion is typically 1.1 to1.2.

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

Sanitation procedures include the use of iodophore solutions as disinfectant for tools and nets and other equipment used between ponds and stocks of fish. Fish Health staff monitor the fish on a biweekly basis and disease treatment is done on an as-needed basis as per the Co-managers Fish Health Policy (1998).

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

Gill ATPase activity is not monitored. Visual cues are used to assess readiness to migrate, i. e. working the screens, scale shedding, and loss of parr marks.

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.

As previously mentioned, fish health is closely monitored by WDFW Fish Health Specialists and general condition and survival rates are monitored daily by trained hatchery personnel. Mortalities are removed daily and the rates of mortality are closely monitored for each rearing vessel. Customary salmon feeds are fed that contain all of the necessary nutrients for proper growth and development. All of these measures reduce the likelihood for adverse genetic and ecological effects to listed fish under propagation.

SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

10.1) Proposed fish release levels. *(Use standardized life stage definitions by species presented in **Attachment 2**. "Location" is watershed planted (e.g. "Elwha River").)*

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling	1,000,000	70	June	Wallace River
Yearling				

Note: 70 fpp ~ 83 mm fork length

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

Stream, river, or watercourse: Wallace River (07.0940)

Release point: Wallace River Hatchery at RM 4 on the Wallace River that enters the Skykomish River at RM 36.

Major watershed: Snohomish River

Basin or Region: Puget Sound

The fish are released on-station from the Wallace River Hatchery directly into the Wallace River. The Wallace River drains 4 miles to the Skykomish River, which feeds into the Snohomish River and into Puget Sound (at the juncture of Possession Sound and Port Susan between the Tulalip Indian Reservation and the city of Everett).

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

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size (fpp)	Yearling	Avg size
1992					125,600	53		
1993					404,500	50		
1994					642,700	70		
1995								
1996					918,000	82		
1997					1,120,000	70		
1998					920,000	74		

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size (fpp)	Yearling	Avg size
1999					384,050	90		
2000					835,000	59		
2001					1,223,194	58		
2002					795,123	72		
2003					1,026,559	65		
Average					763,157	68		

10.4) Actual dates of release and description of release protocols.

The sub-yearling (fingerlings) summer chinook are released during the first week of June each year, and if weather is permitting, on a day of high flow to encourage downstream migration. This helps to minimize their exposure to predation and reduce interactions with wild fish by reducing travel time and providing more turbid water conditions with greater volume.

10.5) Fish transportation procedures, if applicable.

No transportation of smolts takes place. All program fish are released on-station.

10.6) Acclimation procedures.

All fish are incubated and reared on the same water source (river) that they are released into.

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

Program fish ware 100% identifiable as hatchery-origin fish. There is currently an agreement between WDFW and the Tulalip Tribe to release 600,000 mass marked (Ad clip only), 200,000 adipose-fin clip/coded-wire tagged (Ad + CWT) and 200,000 coded-wire tagged only fingerling summer chinook to represent a double index group.

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

There are no surplus fish at this stage.

10.9) Fish health certification procedures applied pre-release.

WDFW Fish Health staff evaluates the health of the fish a maximum of 2 weeks prior to release and conduct diagnostic assays for the detection of any infectious disease agents as per the Co-manager's Fish Health Policy (1998).

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

In the case of a catastrophic event (drought or flooding) critical to fish survival, the fish would be released early to prevent their loss in the ponds.

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 delay in the rivers, limiting interactions with listed chinook. To minimize the risk of residualization and impact upon natural fish, hatchery fish are reared to fingerling size (typically 70 fpp). They are monitored closely for smolting activity in the spring of the year. Fingerlings are released during periods of high flow, if possible, and when they are displaying high levels of activity in the ponds (working the outlet screens and sides of the ponds). These observations are made to ensure that program fish will actively migrate downstream thus minimizing the time spent in the river and minimizing their interactions with wild fish (see section 2.2.3).

In addition, a rearing parameter of the sub-yearling program is to attain a coefficient of variation (CV) for length of 10.0% or less in order to increase the likelihood that most of the fish are ready to migrate (Fuss and Ashbrook 1995). Such fish would be more likely to residualize in fresh water and interact with listed wild fish. The average CV for release years' 1996-2002 was 8.68%.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

Elements of the annual Monitoring and Evaluation plan for this program are identified in Section 1.10. The purpose of a monitoring program is to identify and evaluate the benefits and risks that may derive from the hatchery program. The monitoring program is designed to answer questions of whether the hatchery is providing the benefits intended, while also minimizing or eliminating the risks inherent in the program. A key tool in any monitoring program is having a mechanism to identify each hatchery production group. This is accomplished by identifying production groups with distinct otolith marks, adipose clips, coded wire tags, blank wire tags or other identification methods as they become available. By identification, this will allow for selective harvest on hatchery stocks when appropriate, monitoring of interactions of hatchery and wild fish wherever they co-mingle in riverine, distribution and utilization of estuarine and marine habitats and assessment of the status of the target population.

In a cooperative effort between WDFW, the Tulalip Tribes and NOAA Fisheries, extensive monitoring, biological sampling and research, focused on juvenile salmonids in the Skykomish and Snoqualmie Rivers, the Snohomish estuary, and nearshore marine areas and pocket estuaries, was initiated in 2000. Ongoing juvenile monitoring programs are beginning to provide valuable information on out-migration timing of both hatchery and natural-origin chinook salmon. Smolt traps in the Skykomish River have been operated annually since 200 and in the Snoqualmie River since 2001. Also, an extensive adult monitoring program (stream surveys and biological sampling) is conducted annually to document origins (HOR/NOR ratios, stray rates), age, and size of Chinook on natural and hatchery spawning grounds throughout the basin.

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

WDFW, the Tulalip Tribe and NOAA Fisheries will continue to monitor chinook escapement to the Snohomish system to estimate the number of tagged, untagged and marked fish escaping to the river each year; e.g., spawning surveys of carcasses sampled for scales, otoliths, adipose-fin clips, coded-wire tags (CWT's) and tissues for DNA

Also, smolt trapping (in the Skykomish and Snoqualmie systems) and estuarine and nearshore marine surveys will continue to provide important information on the co-occurrence, out-migration timing, relative abundances and relative sizes of program fish as well as listed fish and non-chinook species.

In addition to monitoring the release and natural out-migration in the smolt trapping studies, a portion of the hatchery summer chinook fingerling release will be retained at the Wallace River Hatchery to provide fish for chinook trap efficiency trials. A total of 8,000 marked fingerlings will be retained, of which 4,000 will be used in four trap

efficiency trials of 1,000 each above the Skykomish River smolt trap, and the other 4,000 will be used in four trap efficiency trials of 1,000 each above the Snoqualmie River smolt trap.

To evaluate the potential risk of the relatively small annual releases of 4,000 Skykomish River chinook into the Snoqualmie River on the contribution of hatchery-origin fish to the natural-origin chinook spawning population in the Snoqualmie system, an analysis was performed (M. Crewson, Tulalip Tribe HGMP) to project how many of these released hatchery-origin fingerlings might survive to contribute effective female spawners in the Snoqualmie River.

An historic marine survival rate for fingerling chinook was applied to the release of 4,000 to get recruitment prior to fisheries. Adult equivalent recoveries (AEQ), by age, based on coded-wire tag groups released from 1987 to 1992 (broodyears 86-91), were used to derive the AEQ survival rate of 0.43% for fingerling chinook.

This rate was first applied to the release of 4,000 chinook fingerlings, followed by a fishery survival rate (1-projected exploitation rate), followed by a projected diversion rate (proportion that might return to the Snoqualmie instead of the Skykomish), followed by the historic female: male sex ratio and historic holding mortality rates for Wallace River Hatchery chinook, and a projected proportion of females that might successfully mate.

A diversion rate of 50% was assumed, which may be conservative because it assumes that half of the released fish will return to the Snoqualmie, rather than to the Skykomish River where they were hatched, reared and imprinted for the duration prior to their release. Next, the historic Skykomish summer chinook female sex ratio of 45.6%, followed by the historic female holding mortality of 19.6% were applied, and finally, an assumed proportion of females (50%) that might successfully mate with other natural-origin Snoqualmie River chinook was applied to estimate a projected proportion of viable female spawners.

The product of this estimate (only 1.1 viable female spawner) was then divided into the average natural chinook escapement into the Snoqualmie River (1986 to 2002 average was 1,427; 1988 to 2002 average was 2,356). The final projection is that the trap efficiency release of 4,000 chinook fingerlings into the Snoqualmie River might contribute about 1 female spawner, which is approximately .0005 to .0008 of the average natural spawning population in the river (see table below).

Trap Efficiency Chinook Released Into Snoqualmie	Recruitment	Fishery Escapement	Diversion Rate	Females entering the Snoqualmie River	Viable Female Spawners	Effective Female Spawners
Fingerling Skykomish River (Wallace River Hatchery) Chinook	Historic AEQ Marine Survival Rate (0.43%; '86-91 CWT recoveries)	(Fishery Mortality @ 30% (70% Survival); Snohomish Chinook Ceiling RER = 24%	50% Diversion to Snoq. Release Site vs Imprint/Home (Sky.)	(Historic Wallace Chinook Sex Ratio (45.6% Female)	(Historic Holding Mortality: 19.7%, or 80.3% Survival)	Proportion of females that successfully mate (assumes 50%)
4,000	17	12	6	2.7	2.2	1.1
Average natural chinook escapement to Snoqualmie River:		**1986 to 2002:**	**1,427**	**0.0008**	= Proportion of trap efficiency fish that might contribute to Snoqualmie River population.	
		1988 to 2002:	**2,356**	**0.0005**	= Proportion of effective female spawners expected to contribute to natural Snoqualmie River Chinook spawning population.	

WDFW and regional co-managers will continue to monitor chinook escapement to the Snohomish system to estimate the number of tagged, untagged and marked fish escaping to the river each year. This will involve spawner surveys sampling carcasses for scales, otoliths, presence/absence of adipose-fin clips and coded-wire tags (CWT's).

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

Funding and resources are currently committed to monitor and evaluate this program as detailed in the Resource Management Plan for Puget Sound Chinook Salmon Hatcheries (Washington Department of Fish and Wildlife and Puget Sound Treaty Tribes, August 23, 2002). See sections 11.1 and 11.1.1 for description of commitments.

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 and evaluation will be undertaken, with consultation with NOAA Fisheries, in a manner that does not result in an unauthorized take of listed chinook. For example, in the past two years of smolt trapping operations in the Skykomish and Snoqualmie rivers, chinook mortalities averaged less than one half of one percent of the chinook trapped (Nelson, Kelder and Rawson, Unpublished reports, 2001-03).

SECTION 12. RESEARCH

12.1) Objective or purpose.

Please see section 11 for M & E projects that are taking place in cooperation with WDFW, the Tulalip Tribe and NOAA Fisheries.

12.2) Cooperating and funding agencies.

See sections 11 and 12.1.

12.3) Principle investigator or project supervisor and staff.

WDFW (Curt Kramer)
Tulalip Tribes (Kurt Nelson, Brian Kelder, Kit Rawson and Mike Crewson)
NOAA Fisheries (Kurt Fresh)

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

See section 2.

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

Publications, annual reports, draft summary reports are available with these details.

12.6) Dates or time period in which research activity occurs.

Publications, annual reports, draft summary reports are available with these details.

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

Publications, annual reports, draft summary reports are available with these details.

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

Publications, annual reports, draft summary reports are available with these details.

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

Publications, annual reports, draft summary reports are available with these details.

12.10) Alternative methods to achieve project objectives.

M&E and research actions were the previous alternative that were rejected and replaced with the Hatchery Reform monitoring projects described in earlier sections.

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

NA

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.

Publications, annual reports, draft summary reports are available with these details.

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the foregoing information 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. Estimated listed salmonid take levels by hatchery activity.

Chinook

ESU/Population	Puget Sound Chinook *(Oncorhynchus tshawytscha)*-Skykomish River
Activity	Wallace River Summer Chinook Fingerling Program
Location of hatchery activity	Wallace River Hatchery, Wallace River (07.0940)/Sunset Falls
Dates of activity	July-June
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)	-	-	-	-
Collect for transport (b)	-	-	-	-
Capture, handle, and release (c)	-	-	-	-
Capture, handle, tag/mark/tissue sample, and release (d)	-	-	-	-
Removal (e.g., broodstock (e)	-	-	-	-
Intentional lethal take (f)	-	-	Up to 560 (up to 280 from Sunset Falls)*	-
Unintentional lethal take (g)	92,400 (5%)**	140,448 (8%)**	104 (18.5%)	-
Other take (indirect, unintentional) (h)	-	Unknown	-	-

*- Up to a total of 700 natural-origin fish are to be used in the broodstock, of which 560 adults represent the fingerling on-station release of 1,000,000 (80%). In addition, 1,320 of hatchery origin are used for broodstock.

** - Fish incubated and reared from natural-origin chinook only. Also, assuming all spawned fish are females (up to 560).

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.