HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	Marblemount Fingerling Fall Chinook Program
Species or Hatchery Stock	Fall Chinook (Oncorhynchus tshawytscha) Skagit River
Agency/Operator	Washington Department of Fish and Wildlife
Watershed and Region	Skagit River, Puget Sound
Date Submitted	August 04, 2005
Date Last Updated	July 25, 2005

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Skagit Fall Chinook Fingerling Program

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

Skagit River Fall Chinook (*Oncorhynchus tshawytscha*) – listed as "threatened" June 2005.

1.3) Responsible organization and individuals

Name (and title):	Chuck Phillips, Region 4 Fish Program Manager Ted Thygeson, Complex Manager	
Agency or Tribe:	Washington Department of Fish and Wildlife	
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

Skagit System Coop (tribe)

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

Operational Information	Number
Annual operating cost (dollars)	$351,149
The above information for annual operating cost applies cumulatively to the Marblemount Hatchery Fish Programs and cannot be broken out specifically by program. Funding sources are General Fund – State, General Fund – Federal & Wildlife State – Local (Seattle City Light).	

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

Broodstock Collection: RM 56.5 in the mainstem Skagit River

Incubation and Rearing:

Marblemount Hatchery: Located on Clark Creek (04.1421) at RM0.5, which is a tributary to the Cascade River (04.1411). The Cascade River is a tributary to the Skagit River (03.0176) at RM 78.

Release:

Baker River trap: Baker River (03.0435). RM 1 on the Baker River that is a tributary to the Skagit River at RM 56.5

1.6) Type of program.

Integrated research. 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.

Research (Monitoring & Evaluation of wild fall chinook)

The Marblemount Hatchery fall chinook fingerling program is an indicator stock program designed to assist in the evaluation of harvest impacts to the wild Skagit River fall chinook population. All 222,000 fall chinook released in the program receive coded-wire tags (CWT's) and are marked externally with an adipose-fin clip (Ad). Mark recovery programs directed at the hatchery-origin fall chinook are used to estimate natural-origin Skagit River fall chinook salmon migration patterns, run timing, total survival, contribution to fisheries and straying to other watersheds.

At the present time, the program uses 100% naturally spawning fish. As program continues, the intent is to integrate the broodstock at a 10-20% rate

1.8) Justification for the program.

The program will be operated to provide the most efficient and least intrusive way to produce the desired number of chinook smolts of the same genotype as the wild population. Previous efforts to capture and tag wild smolts were more costly, less successful, and led too high mortality rates. The program will also be operated to provide for harvest opportunity while minimizing adverse effects on the listed fish. These objectives will be accomplished in the following manner:

1) Hatchery-origin fish will be released as zero-age, migration ready smolts to mimic the size of the naturally produced out-migrants and to minimize emigration time to saltwater thereby minimizing potential competition with and predation on natural-origin fish**.**

2) All hatchery-origin fish will be coded-wire tagged/adipose-fin clipped to distinguish them from natural-origin listed fish.

3) Hatchery fish will be propagated using appropriate fish culture methods and consistent with the Co-Managers Fish Health Policy, spawning and genetic guidelines and state and federal water quality standards.

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

Table 1. Summary of risk aversion measures for the Marblemount fall chinook program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.2	All water sources are permitted through trust water right permit # S1-20241. Monitoring and measurement of water usage is reported in monthly NPDES reports.
Intake Screening	4.2	The intake at Marblemount hatchery does not comply with current NOAA requirements. However, all intake screens are 1" x .125" mesh and are in compliance with state and federal guidelines (NMFS 1995,1996). No chinook are passed above Clark Creek. Jordan Creek is utilized only from May through September.
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 13-3015.
Broodstock Collection & Adult Passage	7.9, 2.2.3	Fall chinook will be collected in lower river proportional to the annual total adult return across the annual spawning time between the second week of September through October.
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

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, and production objectives.	As an indicator stock, represent/mimic the wild stock in the area.	As an indicator stock, survival and contribution to fisheries and escapement will be estimated for wild fish each brood year released. Monitor HOR/NOR ratios on the spawning grounds.
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 between 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.	Minimums of 160 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 on natural and hatchery-origin fish.	All fall chinook in the program are adipose-fin clipped/coded-wire tagged as an indicator stock to assist in the evaluation of harvest impacts to the wild Skagit River fall chinook population.	Returning fish are sampled throughout their return for length, sex, and coded-wire tags (CWTs).

Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens. Follow Co-managers Fish Health Disease Policy (1998).	Necropsies of fish to assess health, nutritional status and culture conditions.	WDFW Fish Health Section 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 brood-stock 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 (150 fish/lb) and released at a time that fosters rapid migration downstream	Monitor size, number, date of release and mass mark quality. Additional WDFW projects: straying, in-stream evaluations of juvenile and adult behaviors, NOR/HOR ratio on the spawning grounds, fish health documented.
Artificial production facilities are operated in compliance with all applicable fish health guidelines, facility operation standards and protocols including HOPPS, Co-managers Fish Health Policy and drug usage mandates from the Federal Food and Drug Administration.	Hatchery goal is to prevent the introduction, amplification or spread of fish pathogens that might negatively affect the health of both hatchery and naturally reproducing stocks and to produce healthy smolts that will contribute to the goals of this facility.	Pathologists from WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed.
Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring.	NPDES permit compliance WDFW water right permit compliance	Flow and discharge reported in monthly NPDES reports.
Water withdrawals and in-stream water diversion structures for hatchery facility will not affect spawning behavior of natural populations or impact juveniles.	Hatchery intake structures meet state and federal guidelines where located in fish bearing streams.	Barrier and intake structure compliance assessed and needed fixes are prioritized. Water intake structures are not in compliance with NOAA standards.
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.	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).

160 adults (80 pairs assuming 50:50 males/females).

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	Baker River (04.0435)	222,000
Yearling		

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

Only one broodyear (1999) has been tagged. Survival data is incomplete at this time.

Skagit fall chinook escapement (natural) levels from 1995 to 2003 have been 666, 1,521, 409, 2,388, 1,043, 3,262, 2,606, 4,866 and 1,161, respectively (WDFW Data, Science Division).

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

1998

1.14) Expected duration of program.

Ongoing

1.15) Watersheds targeted by program.

Skagit River (03.0176) & Baker River (03.0435)

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

To eliminate program would not allow WDFW and the tribes to evaluate the harvest impacts on the wild Skagit River fall chinook population. Also, WDFW and the Skagit Coop each year enter into an agreement, which is identified as the Skagit Memorandum of Understanding. The principle purpose of the memorandum is to set forth mutually agreed upon steps and conditions under which all Washington fisheries affecting Skagit stocks will be managed for that particular year, with the primary management objective of providing consistent and equitable management of inside and outside treaty (*US v Washington*) and non-treaty fisheries. A second objective is to outline steps to plan for and attain cooperative, joint management of Skagit System fisheries in future years.

This process follows the Puget Sound Salmon Management Plan (PSSMP), a federal court order, which describes the co-management responsibilities of WDFW and the tribes (Skagit Coop) 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."

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 an HGMP to cover the stock/program of chinook produced at the Marblemount facility 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.

Lower Skagit/MS Tributary Fall Chinook *(Oncorhynchus tshawytscha)*

Lower Skagit chinook are those that spawn in the Skagit mainstem and its tributaries downstream of the Sauk River (Baker River, Finney Creek and Day Creek). Allozyme analyses indicate that Lower Skagit chinook have statistically significant genetic differences from most other Puget Sound chinook populations, including Upper Sauk, Lower Sauk, Suiattle and, preliminarily, Upper Cascade chinook. They did not have significant genetic differences from Upper Skagit chinook, but DNA analysis indicates that there are significant genetic differences with Upper Skagit summer chinook. Lower Skagit chinook spawn primarily in October, generally later than Upper Skagit spawners (WDF et al. 1993). Peak redd counts are in mid-October. It is assumed that Lower Skagit falls are predominately comprised of zero-age life history strategies

Escapement of Skagit Summer/Fall Chinook

Year	Lower Sauk (Summer)	Upper Skagit (Summer)	Lower Skagit (Fall)	Total
1988	1,052	8,077	2,339	11,468
1989	449	4,781	1,454	6,684
1990	1,294	11,793	3,705	16,792
1991	658	3,656	1,510	5,824
1992	469	5,548	1,331	7,348
1993	205	4,654	942	5,801
1994	100	4,565	884	5,549
1995	263	5,948	666	6,877
1996	1,103	7,989	1,521	10,613

1997	295	4,168	409	4,872
1998	460	11,761	2,388	14,609
1999	295	3,586	1,043	4,924
2000	576	13,092	3,262	16,930
2001	1,103	10,084	2,606	13,793
2002	910	13,815	4,866	19,591
2003	1,493	7,123	1,161	9,777

Source: WDFW data

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

Puget Sound Chinook *(Oncorhynchus tshawytscha):*

Suiattle Chinook, Upper Cascade Chinook, Upper Sauk Chinook, Lower Sauk Chinook, Upper Skagit Chinook.

Bull Trout/Dolly Varden *(Salvelinus confluentus)*

Lower Skagit bull trout have been identified as a distinct stock based on their geographic distribution. The Skagit River, below Gorge Dam (excluding the Baker River), is composed of several major tributaries (Sauk, Cascade, Suiattle, and Whitechuck rivers) and numerous “minor” tributaries, which range in size and length from small rivers to small creeks. Bull trout populations utilize much of this extensive area for spawning and rearing areas. These populations are apparently composed of anadromous, fluvial, and resident life history forms.

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

- Describe the status of the listed natural population(s) relative to critical and viable population thresholds

Chinook:
Preliminary critical and viable population thresholds under ESA have been determined by the Co-managers (Puget Sound) Technical Review Team (PSTRT) to be at 4,800 and 14,900, respectively for Skagit summer/fall chinook (PSTRT 2003). For Skagit spring chinook, preliminary critical and viable population thresholds under ESA have been determined by the PSTRT to be at 576 and 3,000, respectively. And finally, the preliminary critical population threshold has been determined by the PSTRT to be at 2,200 for the Upper Skagit, 900 for the Upper Sauk and 400 for the Lower Skagit summer/fall chinook stocks. No viable population thresholds have been determined. The SaSI report (draft 2002) determined the populations of Upper Skagit, Upper Sauk, Upper Cascade and Lower Sauk stocks as "depressed", the Suiattle chinook stock as "healthy" and the lower Skagit mainstem chinook stock to be "depressed".

Bull trout:
This stock is classified as Healthy. Part of the difficulty in assessing the status of this stock is due to the size of the Skagit system, the remoteness of the upper watershed, the extensive geographic overlap among life history forms, and the overlap between bull trout and salmon spawning areas. (WDFW 1997)

-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.

Unknown

-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.

SKAGIT CHINOOK				
Brood Year	**Est. Females**	**Potential Eggs* (Millions)**	**Total Smolts**	**Survival to Migration**
1989	3274	14.7	963,930	6.5%
1990	8468	38.1	233,603	0.6%
1991	2923	13.2	1,777,330	13.5%
1992	3598	16.2	2,142,078	13.2%
1993	2793	12.6	1,436,530	11.4%
1994	2847	12.8	1,310,448	10.2%
1995	3465	15.6	414,691	2.7%

* At 4,500/female

Range of Natural Origin Recruit per Spawner (1992 to 1999) = .356 to 2.619 : 1 Average is 1.132 spawner / recruit.

Source: WDFW trapping data

-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.

Preliminary data shows 5% of fish on spawning grounds in the Lower Skagit MS/Tributaries are of hatchery-origin (J. Scott, WDFW, pers. comm. 2002). WDF&W will attempt to monitor chinook escapement to the Skagit River sites to estimate the number of tagged, untagged and marked fish escaping to the river each year. The mainstem is very difficult to physically survey. Aerial surveys are done on the entire mainstem.

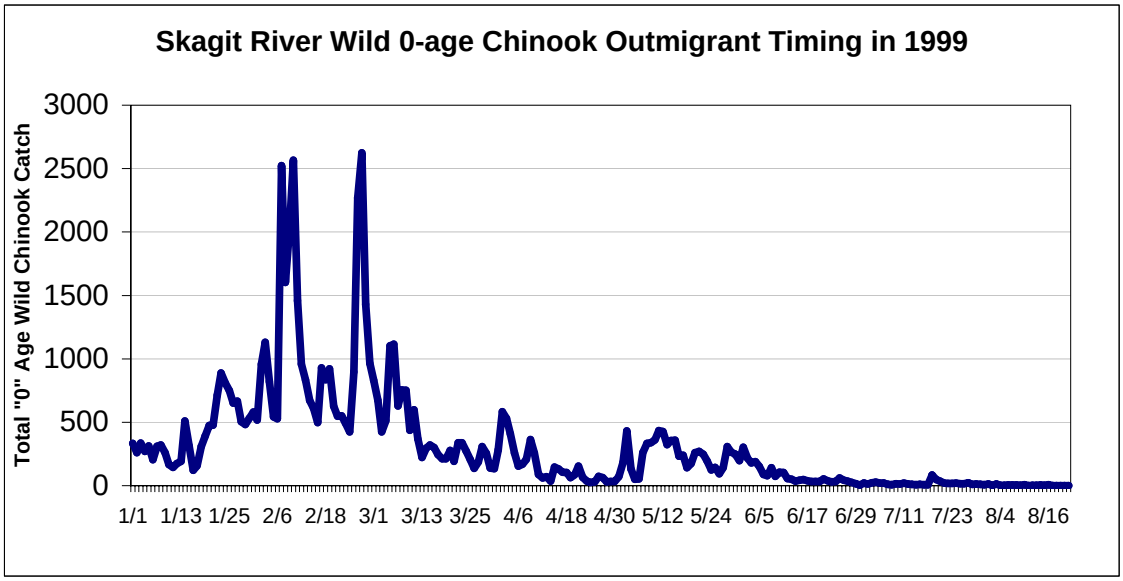
2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take.

-Describe hatchery activities 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.

Wild chinook adults will be captured for the express purpose of propagation for use as an indicator stock for the Skagit River system. Normal hatchery mortality can be expected during the incubation, rearing and release of these fish (90-95% total survival to release).

The Jordan Creek Intake, one of four water supplies for the hatchery, may pose a low to moderate risk of take to listed fish by seasonally delaying passage or restricting access to Jordan Creek. But, having a very steep and unstable gradient, the potential utilization by chinook in Jordan Creek is limited. The intake is not in operation from October through April and salmonids have upstream passage during that time. Adult salmonids are not passed upstream into Clarks Creek, an additional hatchery water supply.

Juvenile fall chinook salmon produced through the program may interact with emigrating natural-origin chinook salmon in the Skagit River basin freshwater and estuarine areas, after the hatchery fish are released in June. Due to the similar sizes of the hatchery (66 mm fl) and natural-origin chinook salmon (60 mm fl; Seiler et al., 1999-2001) predation by Marblemount Hatchery fall chinook on natural-origin chinook salmon encountered in the river and estuary is an unlikely event. Also, the USFWS (1994) has suggested that juvenile salmonids can consume fish which are one-third or less their own body length. Given this rule of thumb and approximate sizes of hatchery and wild fish at the time Marblemount Hatchery chinook are released, predation by hatchery smolts is not expected to be a significant problem. The degree to which the hatchery-origin chinook salmon may compete with natural-origin chinook salmon for food resources in the Skagit River basin is unknown. Marblemount Hatchery fall chinook salmon are released in June, near the end of the annual natural chinook salmon emigration period in the Skagit River Basin (Figure 1 below).



Because the hatchery fish are released as smolts, the fish exit the river rapidly after release (hatchery chinook trapping data from Seiler et al., 2000, 2001, 2002), reducing the duration of interaction with natural-origin chinook present in the river. Interactions that may lead to food resource competition during the critical freshwater emigration and early rearing phase for natural-origin chinook salmon are not likely to be substantial.

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

Since the program's start-up (1998), all adults taken for broodstock after 1999 would be considered a "take". Refer to table in section 7.4.2 for appropriate information. Normal hatchery mortality can be expected during the incubation, rearing and release of these fish (90-95% total survival to release).

-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 end of 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 annual number of adult fish captured for spawning and the number of juvenile fish released will be limited as described in this plan, and take levels are not expected to be exceeded. NOAA Fisheries will be notified if and when the program is expected to exceed the take in any category.

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 Marblemount Hatchery fingerling fall 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.

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 will 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.

Although not directly related to hatchery programs, the North of Cape Falcon Fishery Planning process should be mentioned as an avenue for developing harvest regulations. This is an annual process that involves co-managers and stakeholders, and a process that is conducted in concert with the Pacific Fisheries Management Council. The primary focus is to develop salmon fishing regulations for commercial and recreational fisheries in marine and freshwater areas. As a result, WDFW and the Skagit Coop each year enter into an agreement, which is identified as the Skagit Memorandum of Understanding. The principle purpose of the memorandum is to set forth mutually agreed upon steps and conditions under which all Washington fisheries affecting Skagit stocks will be managed for that particular year, with the primary management objective of providing consistent and equitable management of inside and outside treaty and non-treaty fisheries. A second objective is to outline steps to plan for and attain cooperative, joint management of Skagit System fisheries in future years.

This hatchery program, and all other WDFW anadromous salmon hatchery programs within the Puget Sound Chinook ESU, operates under *U.S v Washington* and the Puget Sound Salmon Management Plan (PSSMP) (1985). The salmon resource co-management process affirmed through these court orders, and under the court approved plan, requires that both the State of Washington and the relevant Puget Sound Tribe(s) develop

Equilibrium Broodstock 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.

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

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.

Unknown at this time. Program began in 1998 and tag data indicating contribution to fisheries, survival rates, etc. are preliminary at this time.

3.4) Relationship to habitat protection and recovery strategies.

All chinook stocks in the Skagit River basin have been adversely affected by estuarine habitat loss. The Skagit estuary has been reduced by almost two-thirds over the last two hundred years, mainly as a result of diking (WDNR, 1998). Biologists believe the Skagit River estuary is a limiting factor for all chinook production in the basin (Hatchery Scientific Review Group (HSRG), Skagit Briefing Book, 2002).

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).

The Skagit Watershed Council is the Lead Entity for the Skagit basin that includes the lower and upper Skagit River (WRIAs 3 & 4). It is the largest watershed in Puget Sound. The land use in the lower portion is 64% forestry, 22% agriculture, 5% urban, 4% range and 5% other. In the uplands, land use is 73% forestry, 12% range and 15% other.

One of the projects that were ten years in the making (Deepwater Slough) removed two main dikes on state land. This allowed the mainstem and six tributary channels to re-connect and return to their historic paths and restored 200 acres of estuary habitat (see above). This project is expected to produce an additional 1,000 to 2,000 adult chinook and continues to support important migratory waterfowl and shorebird habitat.

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 Marblemount 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 chinook survival rates through predation on newly released, emigrating juvenile fish in the freshwater 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 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 adult chinook originating through the program may also serve as prey for large, mammalian predators in marine areas, nearshore marine areas and in the Skagit River to the detriment of population abundance and the program's success in monitoring and evaluating the wild stock. 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 Skagit 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.

(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
- 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.

Marblemount Hatchery has four water sources available most of the year. Well water provided by five wells produces about 1,000 gallons per minute (gpm) per pump. This water is used for the hatchery and up to six 10' X 100' ponds. Clark Creek, which is spring fed and provides up to 2,500 gpm, is used for starting fish because of its quality and water temperature (40-55 degrees Fahrenheit). Clark Creek also flows through the adult pond and is used to attract and acclimate all fish released and coming back to the hatchery. The bulk of the water is supplied from the Cascade River. Four pumps receive water from a settling pond. Each pumps 2,500 gpm. Jordan Creek is the fourth water source that is used for only about five months out the year. High winter flows force this intake to be shut down. Jordan Creek can provide about 8,000 gpm. Temperatures can range from a low of 38 degrees Fahrenheit to a high of 65. All discharge meets or exceeds NPDES requirements.

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.

At Marblemount, all intake screens are 1" x .125" mesh and are in compliance with state and federal guidelines (NMFS 1995,1996). However the water intakes do not meet current NOAA water intake standards. No chinook are passed above Clark Creek. Jordan Creek is utilized only from May through September. All discharge meets or exceeds NPDES requirements as per the permit # WAG13-3015. All water sources at the Marblemount Hatchery are accessed under one water right permit # S1-20241 (for further information on water rights contact the Department of Ecology).

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Adults are gillnetted on the lower mainstem Skagit River at approximately RM 56.5. Skagit River Coop and WDFW biologists between early/mid September to mid/late October capture them in the lower Skagit 15 miles below Marblemount. The broodstock is selected randomly throughout the time period, spawned on site or hauled to the Marblemount Hatchery and held in a 10' X 100' X 3' concrete raceway for spawning. Fish collected each day that exceed need are immediately released unharmed.

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

Adults are transported to a boat launch in fish tubes. The fish are then placed into a 300-gallon tank and trucked (with aerators) to the hatchery (15 miles).

5.3) Broodstock holding and spawning facilities.

Adults are held in one of three 10' X 100' X 3' concrete raceways (fish are screened out of upper 10 feet while 60 to 80 feet of the pond is covered). Fish are spawned at the holding pond and eggs are transported to the hatchery. Fish that are ripe when caught are spawned on the river and eggs brought to the hatchery.

5.4) Incubation facilities.

Eggs are incubated in isolation buckets at one female per bucket. Once eyed, the eggs are put into vertical incubators @5000 eggs per tray on well water.

5.5) Rearing facilities.

All fall chinook are started in the hatchery in starter tanks (16' X 2.5' X 2'). They are kept in the hatchery until they are transported to acclimation site.

5.6) Acclimation/release facilities.

Fish are transported to the lower Baker River and put in tanks (16' X 2.5' X 2') for three days then released into the Baker River.

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

The present acclimation site is not large enough to take all the fish at one time. To avoid any operational difficulties, fish are taken to the site, acclimated for three days and released so more fish can be brought in.

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 hatchery crew is on stand-by at all times. All parts of the hatchery facility are equipped with low water alarms. All tools are disinfected between ponds to prevent disease transmission. All fall chinook eggs are incubated in isolation initially and then transferred to vertical incubators on well water. At acclimation site fish are held only 3-5 days.

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.

Skagit River indigenous fall chinook.

6.2) Supporting information.

6.2.1) History.

All fall chinook are considered native. The Green River fall chinook stock has been the only non-local introduction since 1951. That was ceased eight years ago.

6.2.2) Annual size.

Up to 80 pairs of fish to achieve a program level of 222,000 fingerlings released

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

The Skagit System Cooperative shall collect a maximum of 160 adults via gillnet fished in the Skagit River below Concrete in the period from early/mid September to mid/late October. It is too early to determine as to how many F1's to use as no adult returns (to the Baker River Trap) have occurred. Significant numbers are not expected until 2003 or 2004.

6.2.4) Genetic or ecological differences.

There is no measurable difference between the hatchery and natural fish at this time.

6.2.5) Reasons for choosing.

Indigenous stock.

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

The risk of among population genetic diversity loss will be reduced by selecting the indigenous fall chinook population for use as broodstock in the program. Broodstock will be collected randomly during the peak migration timing of the wild stock to minimize potential for altering that characteristic of the wild population as well as checking coded-wire tags (CWTs).

SECTION 7. BROODSTOCK COLLECTION

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

Adults

7.2) Collection or sampling design.

Fall chinook adults are collected with gill nets by Skagit River Coop and WDFW biologists between early/mid September to mid/late October in the lower Skagit River near Concrete, Washington. The broodstock is selected randomly throughout the time period, spawned on site or hauled to the Marblemount Hatchery for spawning. Fish collected each day that exceed needs are immediately released unharmed.

7.3) Identity.

Fall chinook spawning begins in the second week of September, peaks in early October, and continues through October. Wild fall chinook are identified at this time by the presence of an adipose fin.

7.4) Proposed number to be collected:

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

80 pairs of adults (160 total) need to be captured for broodstock.

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		
1998	2	3		7,000	
1999	6	6	1	33,500	
2000	39	19		175,969	
2001	36	25		196,700	
2002	8	9		37,600	
2003	47	51		262,500	

NOTE: Data for brood years 1998 through 2001 below are losses accrued prior to spawning at the hatchery. No data for in-river collection mortality.

Year	Held at Hatchery	Hatchery Loss	Total Mortality
1998	5	0	0.0%
1999	17	4	23.5%
2000	88	9	10.2%
2001	74	1	1.4%
2002	19		0.0%
2003	181	12	6.2%

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

All wild fish netted in excess of program needs are immediately returned unharmed to the river.

7.6) Fish transportation and holding methods.

Adults are caught in the Skagit River and transported in fish tubes to a boat launch. From there, they are transported by tank truck to the hatchery (15 miles). At the hatchery they are tagged with a floy tag and placed into a 10' X 100' X 3' raceway. Well water is circulated in the holding pond (2/3 of pond is covered with tarp to reduce stress).

7.7) Describe fish health maintenance and sanitation procedures applied.

Formalin drip at 1:10,000 is applied to the pond for treatment of fungus. All tools are disinfected between each use. Follow standard protocols as defined in the Co-managers Fish Health Policy (1998).

7.8) Disposition of carcasses.

Carcasses are used for nutrient enhancement or 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.

The risks of fish disease amplification will be minimized by following the sanitation and fish heath maintenance and monitoring guidelines in the Co-Managers Fish Health Policy (1998). Fall chinook are collected randomly and proportional to the annual total adult return across the annual spawning time between the second week of September and through October (they are captured in the lower Skagit 15 miles below Marblemount Hatchery).

SECTION 8. MATING

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

8.1) Selection method.

Broodstock are selected randomly throughout the total run. Adults may be spawned on the day of capture, if ripe. Otherwise, they are transported to the hatchery and held for spawning.

8.2) Males.

A primary and secondary male (to one female) are used in the mating scheme.

8.3) Fertilization.

Primary male sperm is mixed with eggs (from one female) and allowed to set for 30-60 seconds. The secondary male is added and also given 30-60 seconds. Water is then added to activate sperm. Eggs are then poured into a colander and drained. The colander is then dipped and drained twice in an iodophor solution of 100 ppm. Eggs are then placed into an incubator and water hardened for 1 hour in an iodophor solution of 100 ppm.

8.4) Cryopreserved gametes.

NA

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

CWT's will be read prior to spawning to maintain stock integrity. All fish will be randomly selected and mated to represent the entire run timing**.**

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.

To ponding: Goal is 90%. For broodyear 2001, the egg to fry survival was 90.5%.

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

To account for mortality, some additional eggs will be taken above program needs.

9.1.3) Loading densities applied during incubation.

Eggs from one female are loaded into an isolation bucket with a flow of 1.5 gpm. After eyeing up, dead eggs are removed and the remaining eggs are incubated in vertical Heath Trays at 5,000 per tray with a flow of 3.5 gpm.

9.1.4) Incubation conditions.

All eggs are incubated on well water at 47 degrees. Dissolved oxygen (DO) readings are 12 ppm coming in to the incubators and 9.5 ppm going out.

9.1.5) Ponding.

Fry are ponded at a KD (condition factor) between 1.75-1.97 and at 95-100% buttoned up. Mean length is 40.325 mm and a mean weight of .498g/f.. Fry are ponded into starter troughs in the hatchery building. Fry from the same egg take date are ponded together.

9.1.6) Fish health maintenance and monitoring.

Eggs are picked prior to hatching at a strong-eyed stage. Eggs are treated every other day with formalin at 1,667 ppm until just prior to hatching for fungus control. Fry loss is picked at time of ponding. Loss is picked daily from the ponds. Fish pathologist checks fry every 3 weeks.

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.

Well water, with constant temperature and low silt load, will be used in the incubation process. Eggs are treated every other day with formalin at 1,667 ppm until just prior to hatching for fungus control. All dead eggs are picked and removed to prevent any disease transmission.

9.2) Rearing:

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.

For the 2001 broodyear, the fry to smolt survival was 98.8%.

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

Maximum loadings for this stock are 3 lbs/gpm with a density index of 0.20. Actual levels reached are 2.0 lbs/gpm and a density index of 0.11.

9.2.3) Fish rearing conditions

All fish are started in the hatchery building on well water at 47 degrees and held indoors (16' X 2.5' X 2' tanks) until transfer to Baker River facility. They are reared in the same size tanks at the release site. Temperatures at the release site range from 40-48 degrees. The dissolved oxygen levels range from 8 ppm-12 ppm at both rearing sites..

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.

Condition factor ranges between 1.101-1.285.

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

Not available.

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

This stock is started on BIO-STARTER up to 400 fish per pound (fpp). At this size, they are switched to BIO-MOIST FEED. Fish are fed every day, 2- 8 times per day. The percent of feed to be fed ranges from 2 to 3.5 % B.W./day. Percent body weight fed will vary so that all fish will reach 200 fpp at the time they are shipped to acclimation site at Baker. Overall conversion is 1.29:1. Once fish are moved to Baker they will not be fed.

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

All tools are disinfected between uses. All ponds are disinfected between uses. All loss is removed daily. Fish pathologist checks fish every 3 weeks. Treatments are made as prescribed by fish pathologist and the Co-managers Fish Health Policy (1998).

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

No gill ATPase activity measured. The migratory state of the release population is determined by fish behavior. Aggressive screen and intake crowding, leaner condition factors, a more silvery physical appearance and loose scales during feeding events are signs of smolt development.

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.**

They are reared under a controlled feeding regime where all the fish are at the same size and mimic the indigenous stock. The Area Fish Health Specialist monitors fish health on a routine basis during rearing. If needed, treatment plans are prescribed in accordance with the Co-managers Fish Health Policy (1998).

SECTION 10. RELEASE

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

10.1) Proposed fish release levels.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling	222,000	150	June	Baker River
Yearling				

Note: 150 fpp ~ 66 mm fork length

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

Stream, river, or watercourse: Baker River (03.0435), tributary to the Skagit R. at RM 56.5
Release point: Below fish trap at RM 1.0
Major watershed: Skagit River
Basin or Region: Puget Sound

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	Yearling	Avg size
1998								
1999			6,350	573				
2000					31,685	134		
2001					162,240	110		
2002					172,700	154		
2003			34,319	198				
Average			20,335	386	122,208	133		

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

All fish are taken to the acclimation site at Baker River trap for 3 days of imprinting. The screens on the ponds are pulled between the 10th and the 20th of June to allow the fish to volitionally migrate.

10.5) Fish transportation procedures, if applicable.

Fish are transferred to Baker ponds in a 800 gallon tank with aeration. The loadings are no more than 0.65 pounds of fish per gallon of water. Fish are in tank for up to 1 hour. Dissolved oxygen levels run from 8 to 10 parts per million (ppm).

10.6) Acclimation procedures

The present acclimation site (Baker River trap) is not large enough to take all the fish at one time. To avoid any operational difficulties, fish are taken to the site, acclimated for three days and released so more fish can be brought in.

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

All of the lower Skagit fall chinook are 100% adipose-fin clipped/ coded-wire tagged as an indicator stock.

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

NA

10.9) Fish health certification procedures applied pre-release.

All fish are checked by a fish pathologist prior to release as per the Co-managers 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 the fish's survival, the fish would be released early to prevent their loss in the pond (trap).

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 fingerlings are reared to sub-yearling size (100-120 fpp) and released in June.

All fish released into the Baker River are imprinted for 3 days prior to release (see section 10.6). This is done to ensure a homing to the lower Skagit River. The fish are released as fingerling smolts to mimic the natural out-migrant characteristics of the native fall chinook and to reduce the potential for predation and competition. Fish are released between the 10th and 20th of June after most of the natural-origin fish have left the system (Seiler et al., 1998-2002).

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). The average CV for release years' 1999-2002 was 5.84%.

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.

Each production group is identified (see section 10.7) with distinct otolith marks, adipose clips, coded wire tags, blank wire tags or other identification methods as they become available, to allow for evaluation of each particular rearing and/or release strategy. 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, estuarine and marine habitats and assessment of the status of the target population. WDFW will attempt to monitor (see section 11.1.2) the chinook salmon escapement into the target and non-target chinook populations to estimate the number of tagged, un-tagged and marked fish escaping into the river each year and the stray rates of hatchery chinook into the rivers.

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

WDFW will coded-wire tag/adipose-fin clip the fall chinook fingerling released from the hatchery each year to allow monitoring and evaluation of juvenile out-migrants (Seiler et al., 1998-2002) and adult returns. Also, to maintain separation during hatchery spawning between springs, summer and fall chinook stocks.

WDF&W will also monitor chinook escapement (see Section 11.1.2 below) to the Skagit River sites to estimate the number of tagged, untagged and marked fish escaping to the river each year. This monitoring will allow for assessment of the status of the target population and the success of the program in achieving restoration objectives. Also, smolt trapping and estuarine surveys allow for more assessment of the status of the target population (work being done by WDFW (D. Seiler), UW/NOAA Fisheries and Skagit System Coop).

WDFW and the tribes shall review the results from the spring, summer and fall exploitation rate indicator stock programs to determine if all programs are required.

Also, the above monitoring and research will be regularly evaluated by the co-managers with the intent of adjusting as appropriate the HGMPs consistent with stock recovery and fishing objectives.

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

Monitoring of the chinook escapement will take place as long as funding is available. The mainstem is very difficult to physically survey. Aerial surveys are done on the entire mainstem. 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). Commitments to M&E are listed in section 11.1.1

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.

Spawning ground surveys and biological sampling occurring during the recovery will employ measures to ensure that effects on the survival of the listed chinook salmon population are insignificant. Salmon redds and live spawning fish will not be disturbed during surveys and sampling.

SECTION 12. RESEARCH

The Skagit Tribe, WDFW and UW/NOAA Fisheries are conducting juvenile out-migrant and estuarine studies.

12.1) Objective or purpose.

12.2) Cooperating and funding agencies.

12.3) Principle investigator or project supervisor and staff.

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

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

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

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

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

12.9) Level of take of listed fish: number 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).

12.10) Alternative methods to achieve project objectives.

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

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

SECTION 13. ATTACHMENTS AND CITATIONS

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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)*- Lower Skagit River
Activity	Marblemount Fall Chinook Program
Location of hatchery activity	Marblemount Hatchery, RM 0.5 Cascade River (04.1411).
Dates of activity	Sept-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)	-	-	Up to 100	
Capture, handle, tag/mark/tissue sample, and release (d)	-	-	-	-
Removal (e.g., broodstock (e)	-	-		-
Intentional lethal take (f)	-	-	Up to 144	-
Unintentional lethal take (g)	25,200 (10%)*	4,556 (2%)*	Up to 16 (10%)	-
Other take (indirect, unintentional) (h)	-	Unknown	-	-

* - Using 100% natural-origin chinook at a 1:1 male to female sex ratio.

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.