HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

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Hatchery Program:	South Fork Stillaguamish Chinook Natural Stock Restoration Program
Species or Hatchery Stock:	South Fork Stillaguamish Natural Fall Chinook Stock
Agency/Operator:	Stillaguamish Tribe and WDFW
Watershed and Region:	SF Stillaguamish (WRIA 05), North Puget Sound
Date Submitted:	August 1, 2007
Date Last Updated:	August 1, 2007

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.
South Fork Stillaguamish Chinook Natural Stock Restoration Program

1.2) Species and population (or stock) under propagation, and ESA status.
Chinook salmon: South Fork Stillaguamish Natural Chinook; ESA listed as threatened.

1.3) Responsible organization and individuals

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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

Agency	Involvement
WDFW	Broodstock and spawning ground survey assistance plus possible program operations funding.

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

Current Stillaguamish Hatchery operations are funded through the Bureau of Indian Affairs PL 638 contract and US Canada Indicator Stock funds.

Proposed funding for this project will come from Partnership Salmon funding, WDFW hatchery reform funding/PST and the Stillaguamish Tribe.

There are 3 full time staff working for the Stillaguamish Tribe's hatchery program. . This program will require the addition of one person to the staff.

The average annual operating budget for Stillaguamish tribal hatchery program is $235,000.

The anticipated additional startup cost associated with this program in the initial phase of operations will be an estimated $141,000. This includes all broodstock and spawner ground survey fieldwork as well as hatchery startup and the hiring of an additional staff person.

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

The Stillaguamish Tribe's Harvey Creek Hatchery, is located 2 miles upstream of the mouth of Harvey/Armstrong Creek (WRIA 05.0126). Harvey/Armstrong Creek is located 15.3 miles upstream of the mouth of the Stillaguamish River. Adult holding, spawning, incubation and early rearing will take place at this facility.

The Brenner Trout Hatchery is located 31 miles upstream of the mouth of the South Fork Stillaguamish where it meets the main stem at Arlington. The hatchery is located 200 feet upstream of the mouth of Trout Farm Creek (05.0358). Final rearing, tagging and release will occur at this facility.

1.6) Type of program.

Integrated Recovery Program.

1.7) Purpose (Goal) of program.

The overall goal of the natural stock restoration program is to increase the natural spawning population of the South Fork Stillaguamish Fall Chinook population while minimizing the effects of hatchery intervention on the genetic integrity of the stock. The increase in the abundance of the ocean recruits will buffer the unavoidable incidental harvest impacts in US and Canadian fisheries in addition to increasing the natural spawning population. The increase of Hatchery Origin Recruits (HORs), and subsequent increases in the NORs will help to buffer existing severe constraints on natural production due to poor freshwater habitat conditions. The long-term goal is to continue supplementation until the habitat is restored to a level that will increase productivity sufficiently to sustain a viable natural origin population in the system that can support essential treaty right fisheries as well as non-tribal sport and commercial fisheries.

1.8) Justification for the program.

The South Fork Stillaguamish Chinook population proposed for supplementation is at high risk of extirpation due to low effective spawning population size (1993-2005 average 219 adults range 78-357), a decreasing abundance trend, low productivity, straying and potential interbreeding of non-native Chinook and North Fork early Chinook, and degraded freshwater and estuarine habitat conditions which limit prospects for the population to recover naturally. The South Fork Stillaguamish fall Chinook stock is one of the independent populations in the Puget Sound Chinook ESU. The NMFS Puget Sound Technical Recovery Team identified recovery of the stock to a viable level in the wild as a requirement for recovery of the Threatened ESA listed Puget Sound ESU. In the absence of a hatchery program to bolster spawner abundance, this population has a high likelihood of becoming extinct as a result of habitat degradation, continued low escapement, and incidental fishery interceptions.

While total harvest rates on Stillaguamish Chinook have declined in recent years, escapements have not increased above very low numbers (most recently 88 adults), indicating that current habitat productivity is very limited. Microsatellite DNA analysis of samples indicate that "as a northern Puget Sound population of fall run Chinook with limited but definite Green River influence, the population has been somewhat introgressed but retains a substantial portion of its native gene pool. Its biological significance can therefore be at least equated with that of other fall run Chinook salmon populations from north of the Snohomish basin (Spidle, per. comm.)."

The South Fork of the Stillaguamish River currently experiences high summer and fall water temperatures and low flow access problems during the spawning migration. In addition extensive winter flooding and high sediment loads limit freshwater survival (SIRC, 2005). In the absence of a hatchery program, this run will likely be lost due to currently degraded habitat conditions in the South Fork watershed.

The Puget Sound TRT has evaluated the South Fork Stillaguamish fall Chinook run as one of three critical at risk stocks of Chinook that need immediate intervention to avoid extinction. The Stillaguamish Implementation and Review Committee (SIRC), the local watershed recovery group, has determined that starting a South Fork Chinook natural stock restoration hatchery is one of the watershed's highest priority projects for implementation.

Stillaguamish Chinook, both North and South Fork Chinook, are major weak stock limiters for all Chinook fisheries for the Pacific Northwest Region and Stillaguamish Tribal fishermen have not had a directed Chinook fishery since the early 1980's or a ceremonial fishery since the early 1990's.

1.9) List of program "Performance Standards".

Performance standards for the program are an increasing trend of population NORs greater than would have occurred without the program, with the returning adults genetically similar to the historic/baseline natural population. By rebuilding the natural spawning population to a stable level above the critical point and with an increasing

population trend line, the co-managers, would transition to an integrated hatchery program where additional harvest could occur without impeding recovery. As natural runs continue to rebuild to healthy sustainable populations, the natural stock restoration and integrated harvest programs would no longer be needed to support directed fisheries on the population.

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

South Fork Stillaguamish Fall Chinook - Integrated Recovery. Assist the recovery of fall Chinook and maintain genetic diversity of naturally spawning populations.

Management Issues and Questions	Performance Standard	Performance Indicator	Comments – Monitoring program requirements
Are the program benefits being achieved?			
What are the measures of success for the program?	Achieve a natural origin (NOR) escapement of 400 fish for four consecutive years.	Estimate escapement of early Chinook by origin (hatchery or natural spawner) in South Fork	1. Estimation of total escapement a. Survey method, counting spawning fish b. Broodstock counted as sampled 2. Estimate hatchery vs. natural origin spawners' a. All hatchery fish are cwt only b. spawning fish are sampled for tags.
Is the hatchery program providing a buffer for catastrophic events in habitat during duration of NOR in freshwater?	The recruits per spawner for the hatchery origin Chinook are above 2.0.	Estimate the recruits per spawner for natural and hatchery origin fish.	1. Estimation of total return and location of spawning for each group, hatchery and natural origin 2. Requires a tag group and estimation of exploitation rates Hatchery fish are tagged 3. All fisheries and spawning escapement sampled
	The natural smolts per spawner is monitored	Estimate index of abundance of natural smolts per spawner for natural origin Chinook	1. Juvenile trap provides an estimate of abundance of outmigrating natural smolts. 2. Natural and hatchery origin smolts can be separated by tags, clips and genetics.
What are the genetic effects on the naturally spawning population?			
How is effective population size and genetic diversity affected?	Contribution rates of hatchery origin adults to the naturally spawning population are representative of total population.	Estimate contribution rate of hatchery adult returns to naturally spawning population	1. Mark on all hatchery releases 2. Sample spawning population for marked fish 3. Estimate total escapement

Management Issues and Questions	Performance Standard	Performance Indicator	Comments – Monitoring program requirements
	Contribution rates of natural origin adults to the broodstock are representative of total population.	Estimate contribution rate of hatchery adult returns to hatchery broodstock.	1. Mark on all hatchery releases 2. Sample broodstock for marked fish
	Genetic diversity of the composite spawning population is maintained.	Estimate genetic diversity for hatchery broodstock and naturally spawning populations.	Indicators for genetic diversity in the hatchery and natural populations will be measured using microsatellites.
Are rearing and release strategies producing fish that will be successful in the wild?			
Hatchery operations are successful	Egg to release survival is over 70%, and total production is 45,000.	Estimate egg to release survival in hatchery	In-Hatchery monitoring plan
Are hatchery fish in the same health condition as wild fish at release	Hatchery fish are in the same health condition as wild fish	Monitor health of hatchery and wild fish	1. Wild fish are sampled at smolt trap (up to 50 smolts) 2. NWIFC also monitors hatchery fish health monthly.
Do hatchery and natural origin Chinook have similar life history and morphological characteristics?	Size composition of hatchery releases are similar to the natural origin juveniles	Estimate the size distribution of hatchery and natural juveniles and test the null hypothesis that they are not significantly different.	1. Measure juveniles prior to release 2. Sample and measure natural and program origin juveniles, at smolt trap 3. Compare out migration timing of both groups.
	Time of release and outmigration are similar for hatchery and natural origin juveniles	Estimate the mean and variance of outmigration for both components of the total outmigration and test the hypothesis that there is no difference.	1. Sample at smolt trap juveniles during outmigration for tags.
		Estimate the proportion of natural and hatchery origin fish	1. Estimate % outmigrants that are natural origin vs. program fish by wanding, and estimate % that are NF vs. SF outmigrants by DNA. 2. Estimate % yearling in adult return using scales, and estimate % that are hatchery origin wanding.

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Management Issues and Questions	Performance Standard	Performance Indicator	Comments – Monitoring program requirements
	Age and sex composition of adult returns are similar to the natural origin adults	Estimate the age and sex composition of hatchery and natural adult returns and test the null hypothesis that they are not significantly different.	1. Sample hatchery and adult returns for age and sex status. Requires a weighted sampling scheme as broodstock and spawning adults are sampled separately. 2. Identify all hatchery fish by tag status.
	Time of adult spawning of hatchery and natural origin adults are similar	Estimate the mean and variance of adult spawning time for hatchery and natural origin fish and test the null hypothesis that they are not significantly different.	Use carcass sampling to estimate spawning times for spawners on the spawning grounds.
	Hatchery and natural origin Chinook are distributing over same areas for spawning	Estimate the proportional distribution of hatchery and natural origin spawning adults and test the hypothesis that they are not significantly different.	1. Spawner surveys collect tag data by reach in the river 2. Hatchery origin fish are marked
Is the broodstock collected so that life-history traits are preserved?	The age, sex and size compositions of the broodstock are similar to the total escapement.	Estimate the age and sex composition of hatchery and natural origin broodstock and test the null hypothesis that they are not significantly different. .	1. All hatchery origin fish are marked 2. All broodstock are sampled for age and sex by origin. 3. Spawning surveys collect data on age, sex, size and location.
Are there impacts on other Chinook populations?			
What is the stray rate to North Fork Chinook spawning areas?	The North Fork Chinook spawners are not impacted by South Fork hatchery returns	Estimate the contribution of SF early to NF early	1. Requires sampling of NF Chinook spawners

1.11) Expected size of program.

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

During the initial stages of the rehabilitation program the co-managers will take no more than 15 pairs of the South Fork Natural Origin Recruits (NORs) in the adult spawning migration based upon forecast return abundance estimates and observations during the spawning migration. After the initial two years, the program size will be re-evaluated to determine if changes are required to meet AHA model and genetic changes.

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location. (*Use standardized life stage definitions by species presented in* Attachment 2).

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling	On-Station	45,000 initially to be released on station from the Brenner Hatchery
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.

This is a new program. It is expected that smolt to adult survival rates will be comparable to those experienced for the North Fork Stillaguamish Chinook natural stock restoration hatchery program, which for the 1993 to1997 brood year on-station releases ranged from a low of 0.16 % to a high of .32 %.

South Fork Summer Chinook Escapement (WDFW)

Brood Year	Original Escapement
1994	96
1995	176
1996	251
1997	225
1998	273
1999	253
2000	235
2001	285
2002	353
2003	105
2004	168
2005	78

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

It is anticipated that the program will start in the fall 2007 with the broodstocking of returning adults.

1.14) Expected duration of program.

The program is expected to continue for at least three generations or until the habitat recovers sufficiently to provide enough fish to sustain the population at a viable level and to meet treaty and non-treaty fisheries needs.

1.15) **Watersheds targeted by program.**

South Fork Stillaguamish, WRIA 05.0001

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

Since reduced harvest rates and the absence of hatchery augmentation have not appreciably increased population abundances, and we are losing genetic diversity in the population under existing conditions, the co-managers strongly feel that the risk of extirpation is greater without taking NORs into the hatchery than any potential reductions in the genetic fitness by doing so.

The North Fork Stillaguamish Natural Stock Restoration Program has been successful at increasing the composite population and not significantly decreasing the genetic diversity.

The Washington co-managers have set an exploitation rate guideline of .25, as estimated by the FRAM simulation model, for the Stillaguamish Chinook salmon management unit. According to the simulation model, this level of exploitation results in a 4% risk of the management unit falling below the critical escapement threshold of 500, and affords a 92% probability of recovery (SIRC, 2005). Limiting Southern U.S. exploitation rate on this stock to 25% or less is consistent with the Puget Sound ESU Resource Management Plan (RMP) for Chinook developed by the Puget Sound Tribes and the Washington Department of Fish and Wildlife. The RMP was approved by the National Marine Fisheries Service pursuant to the ESA.

The Ecosystem Diagnosis and Treatment (EDT) model analysis used in describing the ecosystem processes affecting Chinook habitat capacity and productivity in the Stillaguamish Watershed Chinook Salmon Recovery Plan prioritized restoration and protection actions to be undertaken on a reach-by-reach basis. The model output implicates habitat condition and diversity including high winter flows, the lack of large woody debris, temperature, fine sediment and key habitat quantity as critical factors limiting the productivity of Chinook spawning in the South Fork.

The analysis of the main stem smolt trap and peak flow data have documented the strong correlation between poor survival, high sediment loads and high winter flows. The Stillaguamish Watershed Chinook Salmon Recovery Plan outlines an aggressive approach to habitat restoration and protection. The proposed supplementation program is intended to protect the genetic integrity of the South Fork population until the habitat restoration and protection programs restore Chinook habitats and habitat forming processes.

Initial restoration and recovery plans are being implemented and additional basin wide plans are under development. However, the watershed scale of habitat degradation combined with the cost to restore impacted habitat will limit the speed of recovery. The natural stock restoration program is intended to support natural spawning within the basin until such time that survival and productivity improves to self-sustaining, healthy levels.

SECTION 2. PROGRAM EFFECTS ON NMFS ESA-LISTED SALMONID POPULATIONS. (USFWS ESA-Listed Salmonid Species and Non-Salmonid Species are addressed in Addendum A)

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

This HGMP constitutes the application for the initiation of the program under the Co-managers' Chinook Salmon Hatchery RMP, submitted for ESA and NEPA review by NMFS. ESA authorization for the RMP, and the hatchery programs included under the plan is pending completion of evaluation and determination processes under ESA 4(d) Rule, limit 6 and NEPA. Prior to an ESA determination, this program will be reviewed under NEPA within the Puget Sound Hatchery EIS. ESA coverage for bull trout that are passed upstream will be included.

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

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

Chinook Salmon –
The Stillaguamish Watershed has two ESA-listed natural spawning stocks. The North Fork and South Fork Chinook populations are both considered native. North Fork summer Chinook has composite production (a combination of restoration program fish produced through the Stillaguamish Tribe/WDFW Harvey Creek/Whitehorse Springs.

STILLAGUAMISH CHINOOK STOCK DESCRIPTION

The Stillaguamish Chinook have been divided into two distinct stocks (SASSI, 1993). These are a summer stock and a fall stock. This division was based on spawning timing and differences in geographical distribution. Subsequent genetic work has confirmed the validity of this separation. The summer stock is found in the North Fork of the Stillaguamish while the fall stock found primarily in the South Fork. The Stillaguamish Chinook have been managed for natural production with a combined escapement goal of 2,000 adults for the two stocks.

The adults from the summer stock are seen in the North Fork as early as late May with numbers of adults increasing through July and August. Spawning activity begins in late August; usually around the 25th. Spawning peaks about mid-September and continues past mid-October. The fish are found through out the North Fork (RM 0.0 to 34.4) as well as the larger tributaries. The bulk of the spawning occurs in the main North Fork between RM 14.3 and 30.0 (Deer Creek to Swede Heaven bridge). Boulder River and Squire Creek are the two most important spawning tributaries though Chinook are also found in French, Deer, and Grant creeks; especially during wetter falls when tributary flows are up.

The summer stock generally makes up about 80% of the total Stillaguamish basin Chinook escapement. The status of this population was classified as Depressed in the 1993 SASSI effort. The escapement goal for the basin has not been met since 1976. Escapements since 1993 have not improved significantly; especially when the escapement of just naturally produced fish is examined. It appears that in spite of the ongoing supplementation effort the population is just holding stable. It is too early to tell with any certainty that the recent (1998 and 1999) reduction in fishing rates with lead to increased escapements thought that is certainly the hope.

The life history of the summer stock in particular and the Stillaguamish Chinook in general is typical of most Puget Sound stocks. Puget Sound Chinook have been classified as having an ocean type life history (nearly all the rearing occurs in the marine environment). This is contrasted with populations with stream type life histories; that is extended (a year or more) fresh water rearing, (an example of this type of population would be fish from the Upper Columbia). The vast majority (about 95%) of the young Stillaguamish Chinook migrate as smolts within a few months of hatching. The out migration begins in February and continues through spring with a few continuing their out migration through August. These young migrating smolts are often call fry (little in river growth), fingerling (some in river growth), age 0 and/or sub 1s (migrating during the first growing season at less than 1 year of age). The reminder of the population (about 5%) migrate after a full year of rearing in the river and are typically called yearlings, age 1 and/or sub 2s. The yearling out migration is typically later than the younger fish with most of it occurring during April, May and June.

The fall stock is found in the main stem river, South Fork, Jim Creek, Pilchuck Creek, and lower Canyon Creek. The river entry timing of these fish is much later than that of

the summers with most fish entering the system in August and September. Spawning typically takes place from mid-September through October with peak activity in early to mid-October. Electrophoretic analysis by Marshall et. al. documented that the South Fork Chinook population (fall run) is more closely aligned with Snohomish Basin Chinook populations. This genetic connection is supported by geologic evidence that the South Fork Stillaguamish ran into the Pilchuck River area of the Snohomish Basin in the recent geologic past.

Population structure analysis by Spidle et al. has documented that the South Fork Stillaguamish has absorbed significant Green River hatchery ancestry, however South Fork population remains genetically differentiated from the large complex of populations that are mostly Green River derived. In addition, the microsatellite DNA analysis documented that the South Fork fish have a healthy effective population size.

In the last twenty-five years there have been no releases except from the Stillaguamish tribal facility, which has generally worked North Fork summers. The fall population generally accounts for about 15% to 20% of the basin's escapement. The status of this population is also classified as depressed based on chronically low escapements.

Whenever Chinook populations in the North Puget Sound region is discussed the question of whether or not spring Chinook exist in the basin comes up. The anecdotal reports indicate that spring Chinook may have been present in the Stillaguamish system. Today there are no documented spring Chinook populations in the basin though occasional early redds have been seen in Canyon Creek; an area of reported possible spring Chinook use. It is unclear whether the fish reported in the river in the spring of the year were true spring Chinook or just the first of the entering summer Chinook. As mentioned previously adults thought to be summer fish are seen in the North Fork consistently in late May or early June. There is little habitat in the Stillaguamish basin that one would classify as typical spring Chinook habitat except possibly the upper reaches of Canyon Creek and the South Fork above Granite falls; an area above historical anadromous fish use.

GENETIC INFORMATION

In discussing the genetic diversity of salmon populations they are typically broken into broad categories. The first is call **stock** which is defined as "a group of interbreeding individuals that is genetic distinct and substantially reproductively isolated from other such groups". The next level of the hierarchy is **genetic diversity unit** (GDU), which is defined as "a group f genetically similar stocks that is genetically distinct from other such groups. The stocks typically exhibit similar life histories and occupy ecologically, geographically, and geologically similar habitats. A GDU may consist of a single stock." The final and broadest is call **major ancestral lineage** (MAL) which is defined as "a group of one or more genetic diversity units whose shared genetic characteristics suggest a distant common ancestry, and substantial reproductive isolation from other MALs. Some of these groups are likely the result of colonization and diversification preceding the last period of glaciation." (Busack and Marshall, 1995).

The Stillaguamish Chinook, which is thought to consist of two stocks, is part of the larger Puget Sound MAL. This MAL consists of 5 GDUs: South Sound summer/falls, South Sound spring, North Sound summer/fall, South Fork Nooksack spring, and North Fork Nooksack spring. The Stillaguamish Chinook are on the cusp between the two summer/fall GDUs in the MAL. Recent work indicates that the Stillaguamish fall Chinook genetically align most closely with the South Sound Chinook which includes such stocks as the Green River Falls and the Snohomish summer and fall stocks (Marshall, 1997. Appendix E). It is not known whether this relationship is the result of past planting practices or is a reflection geologic, ancestral relationships.

The Stillaguamish summer stock genetic background is contrasted with the fall stock. It aligns genetically with the North Sound summer/fall GDU. The fish are similar to the Skagit Summer stocks (Appendix E). This may not be surprising given the potential connection between the Skagit and Stillaguamish basins via the Sauk River in recent geological times.

Both the broodstocking area and the release site are within the range of current natural Chinook spawning within the South Fork Stillaguamish.

Scale analysis of NF Chinook between 1985 and 1991 exhibited the following age class structure: 2 yr. olds-4.91%, 3 yr. olds-31.91%, 4 yr. olds-54.72, and 5 yr. olds-8.46%. During the 85-91 period, 95% of the Chinook were sub yearling outmigrants (WDF, 1993).

- Identify the NMFS ESA-listed population(s) that will be <u>directly</u> affected by the program. *(Includes listed fish used in supplementation programs or other programs that involve integration of a listed natural population. Identify the natural population targeted for integration).*

The collection of brood stock from the Stillaguamish South Fork Chinook population will initially reduce the number of adult spawners of that population in the wild. However the increased abundance of hatchery origin returns should ultimately increase the effective spawning population size in the future, increasing both genetic diversity and natural origin production over time.

The direct effect of the program on the North Fork summer Chinook population is expected to be minimal and will be limited to those North Fork Stillaguamish program fish that might stray into the South Fork and be captured during the broodstock and spawning process.

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

Natural-origin South Fork Stillaguamish Chinook, North Fork Stillaguamish Chinook, Stillaguamish basin bull trout, and Stillaguamish basin steelhead may be incidentally affected by the proposed program. Incidental effects may include: capture, handling and release during broodstock collection operations; competition for food and space after early Chinook juveniles are released from Brenner Hatchery; and, enhanced potential for fish disease transfer from hatchery to natural-origin fish. The extent to which listed Chinook salmon and bull trout, and steelhead, will be incidentally affected by the proposed hatchery program is expected to be minimal based on our experience with running the North Fork Chinook program.

There may be interactions between Chinook salmon produced by the South Fork program and other at-risk populations in the Puget Sound Chinook ESU through occupation of the same marine environments and co-occurrence in fishing areas However, the proposed program will primarily affect the South Fork Chinook population, with potential secondary effects on the North Fork population. Effects on other Chinook salmon populations in the ESU are not likely to be substantial, given the small scale of the Brenner Creek Hatchery program.

To the extent that the increased recruitment of adults to the spawning migration provides an addition to the potential food supply of the recently listed Killer Whales (O*rcinus orca*) it should be beneficial and buffer predation on the remaining natural origin recruits. Increased carcass densities may also benefit bald eagles. Similarly, minor increases in forage pre base benefiting sub-adult and adult bull trout may occur as they outmigrate or rear in estuarine or nearshore areas. Since most or all bull trout spawning occurs higher in the watershed (USFWS 2004), predation of bull trout juveniles by fingerling Chinook is considered unlikely due to the geographic separation.

2.2.2) Status of NMFS 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 (*see definitions in "Attachment 1").*

The recent year (2000-2005) average abundance of NOR
Stillaguamish Chinook spawners was 1052 fish in the North Fork Stillaguamish River and 245 fish in the South Fork Stillaguamish River The low average abundance levels for the South Fork Stillaguamish Chinook population are in the range of critical levels for an independent Pacific salmonid population below which: depensatory processes are likely to reduce it below replacement; short-term effects of inbreeding depression or loss of rare alleles cannot be avoided; and productivity variation due to demographic stochasticity becomes a substantial source of risk.

The Pacific Marine Fisheries Council determined that even without any kind of harvest, Stillaguamish Chinook would of made its population escapement target of 2000 fish only 3 out of the last 17 years (PMFC, 1997).

Estimates of adult bull trout abundance are not available for the Stillaguamish River basin, and the status of the population relative to population threshold estimates is unknown.

Steelhead (*Oncorhynchus gairdneri*) are native to the Stillaguamish River watershed, and Puget Sound ESU steelhead were recently listed under the ESA in 2007. The status of the natural-origin steelhead population in the basin is unknown.

- Provide the most recent 12-year (e.g. 1994-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.

Escapements from 1994-2005 for North and South Fork Stillaguamish Chinook populations (Co-Manager unpublished data).

Year	North Fork Summer Chinook			South Fork Fall Chinook		
	Natural Origin	North Fork Hatchery Origin	Total NF Escapement	South Fork Escapement	Hatchery Strays	
1994	491	367	677	96		
1995	437	246	594	176		
1996	852	286	993	251		
1997	383	636	862	225		
1998	831	582	1269	273		
1999	542	530	941	253		
2000	892	624	1393	235		
2001	977	216	1066	285	2	
2002	1030	345	1236	353	0	
2003	661	345	884	105	0	
2004	1123	354	1340	168	2	
2005	576	511	947	78	0	

Natural origin return per spawner rates for fall Chinook in the South Fork of the Stillaguamish River is unknown at this time. North Fork natural return per spawner during the 1986 to 1993 period ranged from a low of .78 to a high of 4.99 while program fish from the hatchery ranged from a low of .31% to a high of 1.70% (Rawson, unpublished).

- 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. *(Include estimates of juvenile habitat seeding relative to capacity or natural fish densities, if available).*

	South Fork Chinook		
		SF Native	
Return Year		Stock	
1988		126	
1989		224	
1990		206	
1991		140	
1992		153	
1993		136	
1994		96	
1995		176	
1996		251	
1997		225	
1998		273	
1999		253	
2000		235	
2001		285	
2002		353	
2003		105	
2004		168	

- 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.

	South Fork Chinook		
	NF Cultured	SF Native	Other Stray
Return Year	Into SF	Stock	Hatch.
2001	1	283	1
2002	0	353	0
2003	0	105	0
2004	1	168	1
2005	0	947	0
2006	0	219	0

Agreed Co-Manager escapement estimates derived from spawning ground surveys.

Because South Fork Stillaguamish Chinook have not been tagged to date, it is unknown how many SF Chinook may stray into the NF Chinook population.

2.2.3) <u>Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of NMFS listed fish in the target area, and provide estimated annual levels of take</u> *(see "Attachment 1" for definition 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.

Adult South Fork Chinook that are captured for broodstock will initially be held, spawned and early reared at the Stillaguamish Tribe's Harvey Creek hatchery, which is located on the main stem Stillaguamish below Arlington.

This facility is currently used for the North Fork Chinook Natural Stock Restoration Program.

The current North Fork hatchery program is operating under an HGMP that minimizes impacts on listed Chinook and bull trout.

The annual collection of broodstock in holding pools from the South Fork Stillaguamish River using seines and gill nets will result in the take of listed adult Chinook salmon and potentially sub-adult and adult bull trout.

The activities listed below occur during August, September and October of each year on the South Fork of the Stillaguamish between the confluence of the South Fork with the main stem (river mile XXX and the town of Granite Falls (river mile XXX). These activities have a high potential to temporarily disturb Chinook in their holding and spawning areas. No permanent impacts from these activities have been observed during the 20 years that the research has been conducted on the North Fork Stillaguamish.

Population size, habitat condition and utilization snorkel assessments that occur prior to broodstocking result in stress to adult Chinook holding in pools when snorkelers disturb them out of their holding positions. These snorkel assessments occur, on average, once every 10 days.

Foot surveys for redd counts and carcass sampling disturbs Chinook holding in spawning areas. These surveys occur, on average, once every 7 days.

Broodstock collection of listed Chinook has a high potential for take of the listed species. Fish are captured using a seine or small mesh gill net drifted down through holding pools. Some fish that are initially caught in the net break free and may suffer scale loss and

stress related impacts. Actual mortalities of escaped fish have not been observed. During years were warm water conditions exist; captured fish die during the holding and transport process. Broodstocking will occur 4 to 8 times during the August/September period.

It is expected that up to 30(15 pairs) ESA-listed South Fork Fall Chinook salmon adults will be collected as broodstock (taken from the natural environment) between August 15th and September 30th annually. Incidental take of stray, listed North Fork Summer Chinook salmon population adults may occur during broodstock collection at unknown levels. Annual take of North Fork Chinook salmon is expected to be a negligible proportion of the total population spawning in the North Fork of the Stillaguamish River, and it will be beneficial to the South Fork population to remove fish from other outside populations.

The number of South Fork Fall Chinook and North Fork Chinook that will be captured and handled during broodstocking is unknown at present. The annual number North Fork summer Chinook program fish captured should be very small. We are proposing to sacrifice any coded wire tagged Chinook captured during the initial 3 years of South Fork population to collect important information on hatchery straying from adjacent watersheds.

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

The proposed program is new and there have been no past takes associated with its operation. The existing North Fork Natural Stock Restoration Program is operating under an HGMP that is designed to minimize impacts on listed Chinook and bull trout.

For the North Fork program, historically, broodstock pre-spawning mortality has ranged from 3% during typical cooler water conditions to 32% during extreme high temperature and low flow conditions. Significant changes and improvements have been made in recent years to further reduce pre-spawning mortality in the North Fork program.

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).

Annual take Expectations for listed Chinook salmon.

Activity	Adults	Eggs	Fry/Fingerlings
Capture	10-100 (<25%)	N/A	N/A
Handling	10-100(<25%)	75,000	30-60,000
Lethal Take	10-30 (<25%)	15,000(20%)	4-7000
Rearing	N/A	25-60,000	25-60,000

Tagging	N/A	N/A	25-60,000

Data collected during the operation of the program will provide for more direct estimation of the resulting take of listed adult and juvenile fish. Time and size at release protocols applied for juvenile fish produced in the program are designed to mimic emigration characteristics exhibited by the natural-origin population, reducing the potential for adverse ecological effects. The expected green egg to smolt survival benefit imparted by the program, and the program's likely demographic benefits to the depleted South Fork Stillaguamish Chinook population, should help balance ecological and genetic effects to natural-origin fish that may result from implementation of the program.

- **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.**

Data collected during the brood stock collection and hatchery-rearing activities will be monitored in season for any significant deviations from estimates. All pre-spawn mortalities will be necropsied if possible by NWIFC fish health specialists, and treatments conducted as appropriate. Consultations between the co-managers and NOAA Fisheries will occur to identify causes and potential corrective actions. An annual review of the data collected will be conducted in consultation with co-managers and NOAA Fisheries to identify changes in the program that might reduce the estimated take or revise the estimates of expected take in future years.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan or other regionally accepted policies. Explain any proposed deviations from the plan or policies.

This hatchery program will be a component of the ESU-wide Puget Sound Chinook salmon Hatchery RMP that has been submitted to NOAA Fisheries for potential authorization under ESA Section 4(d) limit 6. The program has also been described and endorsed in the WRIA 05 salmon recovery plan submitted in June 2005 under the Shared Strategy Plan as the recovery framework for the Puget Sound Chinook salmon ESU.

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

This program will operate under the applicable orders of *U.S.* v. *Washington* (US District Court Western District of Washington No. 9213; frequently referred to as the "Boldt Decision"). The Puget Sound Salmon Management Plan (US v. Washington No. 9213

(85-2) (PSSMP) provides for an agreed Equilibrium Brood Document.

The WRIA 05 Salmon Implementation and Review committee was constituted to plan and implement salmonid recovery in WRIA 05 with an initial focus on ESA listed Chinook and bull trout. The current draft plan identifies factors for decline, identifies critical early actions needed for recovery. The SIRC (watershed recovery group) approved the priority ranking and funding request to implement the South Fork Chinook recovery plan.

The program will also integrate into the Pacific Salmon Treaty process for cooperative management of fisheries and enhancement programs to provide optimum production and to receive benefits equal to production originating in its waters.

The program will follow the guidelines set forth in the current edition of the Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State (Co-Managers' Disease Policy).

Current HGMPs are subject to modification by agreement, as new information is developed to indicate that mutual objectives would be better served by modifications (WDFW and PSTT 2004).

The program will be operated in a manner consistent with these plans and commitments.

3.3) Relationship to harvest objectives.

Adult fish produced through the proposed program will be managed in accordance with protective provisions described in the co-managers' Puget Sound Comprehensive Chinook Management Plan – Harvest Management Component. The plan describes the application of harvest limits (recovery exploitation rates) designed to maintain southern U.S. fishery harvests of Stillaguamish Basin Chinook salmon at levels that will not impede recovery of the populations to viable levels over the long term. NOAA Fisheries authorized the harvest plan for Puget Sound Chinook salmon under ESA 4(d) Rule limit 6 in May 2005.

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.

This program is not intended to benefit fisheries, but the presence of HORs in the spawning migration will dilute the impact of any fisheries on the NORs. Estimating the impacts on NORs based on the recent year average of the proportion of HORs and NORs in the run entering the river identifies the limited catch target. The co-managers will maintain the exploitation (total fisheries related mortality) rate, independent of the HORs, to 7% in Southern U.S. waters with the exception that it might be as high as 9% in one year out of five when necessary to conduct Fraser Panel fisheries. Releasing up to 45,000 CWT tagged fish will provide some limited, but important information which will refine our understanding of how harvest rates and locations for this population are similar or

different than for the North Fork population.

3.4) Relationship to habitat protection and recovery strategies.

The EDT model analysis used in describing the ecosystem processes affecting Chinook habitat capacity and productivity in the WRIA 05 Salmonid Recovery Plan prioritized restoration and protection actions to be undertaken on a reach-by-reach basis. The model output implicates habitat diversity including the lack of large woody debris, temperature, fine sediment, and key habitat quantity as critical factors limiting the success of South Fork Chinook. Other important factors include frequency and intensity of flooding. The inverse relationship between number Chinook fingerling migrants and October-December discharge further supports this result (Stillaguamish Tribe). The WRIA 05 Salmonid Recovery Plan outlines system wide approach to habitat restoration and protection.

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 South Fork Chinook Natural Stock Restoration 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 Nooksack River to the detriment of population abundance and the program's success in recovery. Species that may negatively impact program fish through predation may include:

- Orcas
- Sea lions
- Harbor seals
- River otters

Bull trout might benefit from increased Chinook prey base for older juveniles, sub-adults and adults. Older age classes of juvenile steelhead might similarly benefit.

(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).

- North and South Fork Stillaguamish Chinook, Bull trout, and Steelhead

It is possible that young of the year steelhead could be preyed upon, but many will likely not have emerged at the time of release.

(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 Stillaguamish 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. Chinook adults that return to the river 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). With integrated spawning and any carcass seeding efforts, 500 adult Chinook carcasses could contribute; assuming average size of adult Chinook is 18 pounds, approximately 9000 pounds of marine derived nutrients to organisms in the river.

(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 (well, surface), water quality profile, and natural limitations to production attributable to the water source.

South Fork Stillaguamish Chinook prespawning holding, incubation and early rearing will occur at the Stillaguamish Tribe's existing hatchery at Harvey Creek which is a tributary to the main stem Stillaguamish River. Incubation and early rearing water comes from a 65-foot deep well providing 150 gpm, while the main water supply is an intake structure in Harvey Creek. Water temperatures for the well range 48 to 50 F. Surface water temperatures range from 35 to 58 F and dissolved oxygen levels range from 8.2 to 14.1 ppm.

Flow rates:

Harvey Creek Hatchery
Incubation stacks-3 to 5 gpm per stack (well water)
Early rearing raceway/troughs-25 to 35 gpm (well water)
Smaller circular tanks- 45 to 65 gpm (surface)
Larger circular tanks -150 to 200 gpm (surface)

The Brenner Trout hatchery is located just below Granite Falls on the South Fork Stillaguamish. It is a spring fed facility with approximately 300 gallons of minute of flow. The facility will be used for final rearing and release. Currently there exist over 15 concrete raceways of various sizes. The regional fisheries enhancement group and the Stillaguamish Tribe used the facility in the early 1990's to rear Coho.

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 Harvey Creek hatchery has 1/8-inch diameter circular perforated screen at its intake structure and currently meets level one NPDES discharge standards for facilities rearing less than 10,000 pounds annual production.

The Brenner hatchery collects spring water at its source out of a gravel bluff where no fish have access.

All water used for fish rearing at both facilities is returned to receiving waters very close to where it was withdrawn.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Broodstock are captured in-river (within holding pools) by either using a small soft mesh seine or entanglement with small mesh (4 in.) gill net. Once fish are removed from the net, they are transferred to 4ft.x 4ft. x 8 ft. soft mesh holding pens and then moved, using wet burlap bags to the fish transport truck.

Adults will be produced at the Kendall Creek facility through the Captive Brood program for transport to the Skookum Creek Hatchery for spawning.

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

Transportation of Chinook occurs in standard hatchery insulated fiberglass fish hauling truck. Maximum hauling numbers are 60 fish per 360 gallons of water. Compressed oxygen is provided during transport. Spare oxygen tanks are carried on the truck and oxygen flow to the tanks can be monitored from the cab while driving. Salt, MS-222 and synthetic skin coating polymer are added during transport as a therapeutic treatments to reduce stress and improve survival. Hauling times do not exceed 3 hours from loading to unloading. Upon arrival at the hatchery, both males and females are anesthetized and vaccinated to prevent the transfer of enteric red mouth and bacterial kidney disease to the offspring and then kept in separate covered circular tanks until ready to spawn.

5.3) Broodstock holding and spawning facilities.

The Harvey Creek Hatchery has 6 discrete holding ponds for keeping broodstock separated by sex and for sorting ripe and unripe fish. Four 13 ft. diameter by 4 ft. deep circular tanks have a volume of 400 cubic feet and a flow of 45 to 65 gallons per minute. Two 20 ft. diameter by 4 ft. deep circular tanks have a volume of 940 cubic feet and a flow of 150 to 200 gallons per minute. Surface water from Harvey Creek is used for all circulars.

A new spawning shed was recently completed using BIA and HSRG funds and provides very clean and protected area for spawning were spawning effluent is isolated from other parts of the facility and liquid waste goes to a septic system.

5.4) **Incubation facilities.**

The Harvey Creek Hatchery has 6 discrete holding ponds for keeping broodstock separated by sex and for sorting ripe and unripe fish. Four 13 ft. diameter by 4 ft. deep

circular tanks have a volume of 400 cubic feet and a flow of 45 to 65 gallons per minute. Two 20 ft. diameter by 4 ft. deep circular tanks have a volume of 940 cubic feet and a flow of 150 to 200 gallons per minute. Surface water from Harvey Creek is used for all circulars.

5.5) Rearing facilities.

Early rearing

Swim up fry are transferred to 6 deep early rearing troughs that are 26 ft. long, 3 ft. wide and 3 ft. deep. Well water serves these troughs and ranges from 15 to 25 gallons per minute per trough. Fry are reared in these troughs for approximately 30 days and then transferred outside to above ground circular tanks.

5.6) Acclimation/release facilities.

In January fed fry will be transferred to the Brenner Hatchery for final rearing and release. The facility has a number of concrete raceways of various sizes. Bird netting will be installed as well as an alarm system and an emergency oxygen system that will keep the fish alive in the event of a reduction or loss of water flow.

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

This is a new program, so there have been no disasters to date. Stillaguamish Tribal hatchery staff has been successfully operating the existing North Fork Stillaguamish Chinook Natural Stock restoration program for over 20 years.

That experience will help us to minimize losses when we begin this program.

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 Harvey Creek Hatchery has an extensive alarm system with triple flow sensors on the well and incubation/early rearing trough water system. The system was significantly up graded in 1997 after an alarm system failure that resulted in a significant loss of alevins for that broodyear. There are flow alarms on all gravity fed circular tanks with 2 central lines feeding each set of tanks. The alarm system includes a high water/flooding alarm to alert staff to possible flooding conditions. The hatchery is completely surrounded by a 6-foot high razor fence to restrict access. The main incubation well water pump has a double backup, with surface water being pumped by either a gasoline pump or the backup generator. Should the gravity feed water supply fail, the hatchery has multiple oxygen tanks, regulators and O2 stones to provide emergency oxygen until

the flow problems can be resolved.

The Brenner Trout Hatchery will have an alarm system and an automatic battery backup emergency oxygenation system to keep fish alive in the event of a loss of water flow until hatchery staff can get to facility and rectify the problem.

The health of the progeny will be monitored monthly from the time they swim up until Northwest Indian Fisheries Commission fish pathologists certify them for release. Fish health exams will include assessing the rearing environment and testing the fry for parasites, viruses, and bacteria. If a health problem is found the Pathologist will work with staff to implement a remedy, which may include appropriate medication. Sampling procedures meet or exceed those specified in the Salmonid Fish Disease Control Policy.

Current operational policy at the facility specifies that only healthy fish are to be released into the wild (NWIFC and WDFW 1998). Fish exhibiting signs of disease are treated with the appropriate medication, at the recommended rate and manner of application prior to release. Fish that die or fail to respond to treatment are disposed of in a landfill.

All fish entering the hatchery are examined for marks and tags that would identify them as hatchery or natural origin production.

The hatchery is not located in a flood prone area. Hatchery discharge is monitored according to NPDES permits.

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.

Only Chinook captured from the South Fork Stillaguamish River or its tributaries will be used for broodstock for the program**.** All coded wire tagged fish be removed from the broodstock population in the initial 3 years and sacrificed to determine stray rates and contributions of outside hatchery populations to the existing South Fork escapement.

6.2) Supporting information.

6.2.1) History.

The recovery of the South Fork Stillaguamish Chinook population is considered by the Puget Sound TRT to be an essential requirement for the recovery of the Puget Sound Chinook Salmon ESU. The number of natural spawning South Fork Chinook is very

near the critical level. The co-managers and the TRT have agreed that the risk of taking the natural population into the hatchery is less than the risk of genetic integrity loss associated with the small spawning population, the low egg to smolt production, and the potential for loss of among population diversity through genetic introgression from stray hatchery fish from outside the watershed.

6.2.2) Annual size.

Brood stock will be 100% from the natural population for the first three years of the program and will include some HORs in subsequent years of operation. Should the proportion of HORs returning to spawn exceeds 60% of the population, consultation between co-managers and NOAA Fisheries will be undertaken to determine the appropriate proportion of HOR and NOR Chinook to be included in the brood stock.

The proposed broodstocking level of 30 adults is less than 20% of the typical spawning escapement to the South Fork Stillaguamish. Reductions of natural spawners by this amount should not significantly reduce the ability of this population to recover. Given the poor habitat conditions and low survival rates of naturally spawning fish, removal of broodstock and the increased survival within hatchery is likely to keep the run from going extinct.

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

There is no hatchery brood stock currently available, except occasional strays. All brood stock will be collected from natural-origin adult Chinook salmon returns to the South Fork Stillaguamish River for the first three years of the program. In the fourth year and beyond, hatchery origin recruits (HORs) produced by the program will return to the South Fork with natural-origin adults. HORs will be incorporated into the hatchery program brood stock beginning that year. When the proportion of HORs captured exceeds 60%, consultation between co-managers and NMFS will be undertaken to determine the appropriate proportion of HORs and NORs to be included in the brood stock.

6.2.4) Genetic or ecological differences.

There are no differences between the natural stock and the brood stock used to found the proposed program, because selection protocols will be structured to take brood stock throughout the entire adult migration period. Juvenile fish will be reared under conditions that will reduce the likelihood for genetic and ecological differences between natural-origin fish and the propagated population.

6.2.5) Reasons for choosing.

The natural population of South Fork Stillaguamish Chinook was selected for the program, as the goal is to preserve and recover this population.

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.

During the first 3 years broodstock will be checked for coded wire tags and all tagged or adipose clipped fish will be removed from the pool of possible spawners.

Brood stock will be tested for viral and bacterial pathogens. Female Chinook entering the collection facility will be inoculated when they first arrive and during the first sort (during handling) against bacterial kidney disease (BKD) with erythromycin, and enteric red mouth (ERM) vaccine with re-injection mid-summer for early entry females. A broad-spectrum antibiotic such as florfenicol will also be injected into all held Chinook during handling for other diseases including forunculosis and columnaris. Adults will be always be anesthetized with MS-222 prior to handling and injecting to reduce stress, and Poly Aqua will be added to help replace slime loss.

Spawning protocols will ensure the maximum effective spawner population to maximize genetic diversity. Ultimately the objective will be to implement the 5 X 5 factorial protocol.

The Stillaguamish Tribe is a signatory to the Fish Disease Control Policy (1998) developed by the Co-managers of Washington State fish resources. Northwest Indian Fisheries Commission pathologists will sample all adult brood stock for viral and bacterial infection at spawning time. Eggs and fry are sub- sampled on a monthly basis according to procedures in the Fish Disease Control Policy. Corrective actions will be taken on the recommendation of the fish pathologists.

Following standard protocols, newly fertilized eggs will be water hardened and placed in incubation trays that have been pre-loaded with 100 ppm iodophor for one hour for preventative disinfection

Incubation and Rearing will take place in one pass water systems in buildings isolated from the rest of the hatchery operations with both well and Skookum Creek water supply provided under gravity, external electrical service and auxiliary electrical generators with appropriate alarm systems to ensure that water quality parameters do not fall below critical levels.

SECTION 7. BROODSTOCK COLLECTION

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

Adult fish are captured in pools between river mile 15 and river mile 30. Broodstocking begins in mid August and continues until late September. Fish are captured using a seine or small mesh gill net drifted down through the holding pools located within the geographic area of spawning and during the main time period for fish holding in pools prior to moving up on to the spawning grounds.

Capture efficiency is unknown, but estimated to be in the range of 25%-75% depending on the circumstances (Drotts, pers.comm.).

7.2) Collection or sampling design.

Broodstock will be collected over the geographic pool holding range that the fish are typically found in. This may include tributary areas such as Jim Creek and Canyon Creek. Because of the limited number of fish to be captured initially, we may not be able to collect broodstock over the complete period that fish are normally returning to the river.

7.3) Identity.

We are assuming that all non-tagged or non-clipped fish are natural origin South Fork Stillaguamish Chinook. Outside strays are culled from the broodstock group. Other salmon species are identified.

7.4) Proposed number to be collected:

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

The program will begin with a brood stock maximum of 15 pairs (30) adults of the South Fork Chinook participation to a maximum of 50% of the returning adult population.

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

There has been no recent brood stock collection.

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

Any hatchery origin fish from sources other than the program will be culled from the population and sacrificed for coded wire tags. If the Chinook have not been injected with antibiotics, they may be distributed to tribal elders. Injected carcasses will either be frozen and given to the local wildlife rehab center or buried.

7.6) Fish transportation and holding methods.

Adults may be seined from holding areas and transported to the hatchery. Fish will be transported in plastic tubes suspended in tanks by road or helicopter as required for less than 3-hour travel time to the hatchery. On arrival at the hatchery, they will be injected with erythromycin (20 mgs/kg) to control bacterial kidney disease (BKD and a broad-spectrum antibiotic such as florfenicol (20 mgs/kg) to control other diseases including forunculosis and columnaris. Adults will always be anesthetized prior to handling and antibiotic injection to reduce stress. Poly Aqua will be used during fish transport to help replace slime loss.

7.7) Describe fish health maintenance and sanitation procedures applied.

A NWIFC fish pathologist will monitor adult broodstock health on a regular basis. Rearing water will be treated with formalin on a regular basis to control external fungus on the adult broodstock. Additional antibiotic injections may be given to the adults if conditions warrant it.

Eggs will be disinfected with a minimum of 75 ppm iodophor for one hour to reduce the risk of egg associated transmission of pathogens such as those that cause cold water disease (*Flavobacterium psychrophylus*), Bacterial Kidney Disease (BKD, *Renibacterium salmonarum*), and Enteric Redmouth (*Yersinia ruckerii*

7.8) Disposition of carcasses.

Carcasses will be frozen and given to the local wildlife care center or they will be buried. The fish will have been injected with antibiotics and cannot be returned to the river for nutrient enhancement.

7.8) 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.

Following the Co-manager's Fish Disease Policy will minimize the risk of fish disease amplification

SECTION 8. MATING

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

8.1) Selection method.

Spawning will commence when the first female is ripe. Spawners will be selected randomly from the total population of ripe fish held at the facility for spawning.

8.2) Males.

Jacks will be incorporated into spawning at levels equal to the typical proportion of jacks observed in the total Chinook salmon return to the river.

8.3) Fertilization.

All male sperm will be evaluated by NWIFC pathology staff to determine the viability of the sperm prior to adding to the eggs.

Each female and each male's gametes are initially placed in a separate container. Five individual females are then combined into one bucket and re-divided back into 5 buckets giving a sub sample of 5 females in each bucket. An individual male is added to each bucket of eggs for initial fertilization and then 5 males are each moved one-bucket to the right and used again as a separate backup fertilization. In summary, 10 males (5 primary, 5 backup) are used for each 5-pooled females.

Spawning protocols will ensure the maximum effective spawner population to maximize genetic diversity. The objective will be to implement the 5 X 5 factorial protocol, however unequal numbers of spawners by sex may require modifications to this protocol.

8.4) Cryopreserved gametes.

There will be no cryo-preserved gametes utilized in the program.

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 initial collection of 30 adult fish at a 5:5 sex ratio ensures retention of an adequate effective spawning population size for the program, decreasing the likelihood for within population diversity loss. Mates are chosen randomly from all ripe fish in the adult holding pond. The fish collected for spawning will be representative of the Chinook salmon spawner return (age class, fish size, sex ratio, run timing) to the South Fork Stillaguamish River each year.

SECTION 9. INCUBATION AND REARING -

9.1) Incubation:

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

This is a new program. The projected survival from green egg to fingerlings is 70%. Data will be collected to generate information to evaluate the projections and take actions to ensure that desired levels are met or exceeded.

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

Because of the difficulties associated with ensuring that adequate brood stock numbers are obtained during the initiation of the program it is not expected that there will be any eggs surplus to the annual egg take requirement. When the target levels of release are anticipated to be met and the expected survival rates have been confirmed, consultations will be initiated with co-managers and NMFS to determine the appropriate level of the release and the annual brood stock collection goal will be revised to meet that number.

9.1.3) Loading densities applied during incubation.

Loading densities range from 6,000 to 7,000 eggs per vertical Heath tray with flows of 3 to 4 gallons per minute per stack.

9.1.4) Incubation conditions.

Incubation water is well water that is run through a packed column to add oxygen. Dissolved oxygen levels range between 10 and 11 ppm. Loading densities are within the standards currently used by most hatcheries. Silt management is not required unless surface water is used in an emergency where well water is not available. Well water temperatures typically range between 49 and 50 F.

9.1.5) Ponding.

Ponding will occur at swim up. Data will be collected to determine the cumulative temperature units and the degree of button up at this time.

9.1.6) Fish health maintenance and monitoring.

Eggs are given a pre-fertilization rinse with a sodium bicarbonate solution to reduce broken eggshell de-activation of the milt and increase fertilization success.

Eggs will be disinfected with a minimum of 75 ppm iodophor for one hour to reduce the risk of egg associated transmission of pathogens such as those that cause cold water disease (*Flavobacterium psychrophylus*), Bacterial Kidney Disease (BKD, *Renibacterium salmonarum*), and Enteric Redmouth (*Yersinia ruckerii).*

When eggs reach the eyed stage, they will be picked and counted with viable eggs placed back in trays that have substrate in them. If needed, formalin treatment will occur.

Eggs are visually monitored several times per day.

Non-viable eggs are removed at the eyed stage after siphoning to shock the eggs. Dead eggs are removed by hand as well as utilizing a Jennsorter optical egg sorter.

If fungus is found to be a problem during incubation, regular treatments with formalin will be used to control the fungus.

Viable eggs will remain in the incubation trays through hatching and fry button up.

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.

Eggs are incubated in pathogen free, clear well water to reduce the potential for loss from using surface water which may carry high levels of silt, and pathogens.

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.

This is a new program. The projected survival to release is 70%. Data will be collected to generate information to evaluate the projections and take actions to ensure that desired levels are met or exceeded.

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

The goal is to maintain all rearing and pre-release densities for flow below 1.2 lbs/GPM/inch and to maintain all rearing conditions for space below .25 lbs./cubic ft./inch.

9.2.3) Fish rearing conditions

Chinook fry will transferred into early rearing troughs initially and fed 7-8 times per day. After one month in the early rearing troughs/raceways, the fish will be transferred t to the

Brenner hatchery raceways during January. Fish are monitored for growth typically twice a month and have fish health checks once per month until release. The fish are on spring water and experience temperatures ranging between 45 F to 50F during their rearing time. Dissolved oxygen levels are monitored monthly at the hatchery intake. Tanks are cleaned on an as needed basis using a standard swimming pool type vacuum system.

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

There is currently no information available for this parameter. Data growth and growth rate will be collected during program operations for use in adaptive management of the program.

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

There is currently no information available for this parameter. Data on growth and growth rate will be collected during program operations for use in the adaptive management of the program.

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*).

A feeding program will be developed to achieve target size by May. Feed rate may be up to as much as they will eat at times. Skretting or similar dry pellet food will be used.

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

Juvenile fish will be vaccinated against enteric redmouth disease and vibriosis at approximately 200 fpp using the immersion method at the time of CWT application.

The health of the progeny will be monitored monthly from the time they swim up until they are approved for released by a Northwest Indian Fisheries Commission fish pathologist. Fish health exams will include assessing the rearing environment and testing the fry for parasites, viruses, and bacteria. If a health problem is found the Pathologist will work with staff to implement a remedy that may include appropriate medication. Sampling procedures meet or exceed those specified in the Salmonid Fish Disease Control Policy.

Hatchery personnel are trained to identify overt signs of disease in fish of various life stages and will keep pathologist informed of their observations.

Fish that die will be disposed of in a landfill or buried.

All adults will be tested for regulated viral pathogens per the Co-Managers Disease Policy procedures. All spawning equipment (knives, buckets) will be disinfected between discrete units of gametes to avoid cross contamination.

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

Smolt development indices are not expected to be measured.

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

The program will investigate opportunities to modify the rearing operations to incorporate elements of natural rearing, shade, habitat complexity, and natural food.

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.**

The fish will be reared to sub-yearling smolt size for volitional release in May to mimic the natural emigration strategy and allow those with a propensity to hold in the river and migrate as yearlings to do so under natural conditions.

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	45,000	70-90 FPP	May	S.F. Stillaguamish

10.2) Specific location(s) of proposed release(s).
Stream, river, or watercourse: WRIA 05 South Fork Stillaguamish River
Release point: River Mile 31.0
Major watershed: Stillaguamish
Basin or Region: Puget Sound (Lower Strait of Georgia)

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

This is a new program. There have been no Chinook releases from the Brenner Hatchery to date.

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

This is a new program. There have been no Chinook releases from the Brenner Hatchery to date.

10.5) Fish transportation procedures, if applicable.

Chinook fry are to be transported to the Brenner Hatchery during January each year for final acclimation, tagging and release. Fish transportation occurs in a fiberglass insulated fish-hauling tank. Loading densities do not exceed 200lbs. of fry per 680 gallons of well water. Salt is added as therapeutic treatment and water temperatures are within 5 degrees Fahrenheit of the receiving water. Compressed oxygen is fed into the transport tank using a standard welding type regulator set at 10-14 psi. Oxygen levels can be monitored from inside the cab of the transport truck. Transit time is typically 1 hour.

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

Fish will be acclimated to the Brenner hatchery on spring water from January until May at which time a volitional release will begin. After the first year of monitoring the fingerling, if the fish are indicating that they want to move out sooner we may pull the screens to allow the volitional release to begin earlier.

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

All juvenile fish produced each year by this program will be tagged with Coded Wire Tags to allow for their differentiation from natural-origin North and South Fork Stillaguamish outmigrants. South Fork program fish will not initially have an adipose clip in order to improve their survival through selective fisheries. However they may have a supplemental mark such as a freeze brand, elasomer tag or ventral clip to differentiate them from North Fork Stillaguamish hatchery releases.

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

Brood stock levels are intended to produce a maximum of 45,000 fingerling migrants given estimated mortality rated. Should the mortality rates be less than anticipated all fish will be released and coded wire tagged.

10.9) Fish health certification procedures applied pre-release.

Fish are checked monthly during the fry to fingerling growth period and then are checked typically within one week prior to release. Representative samples of healthy fish are examined along with any sick or dead fish. See section 9.2.7 for further fish health information.

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

If adequate time is available, it is technically feasible to transport the fish to other hatcheries within the watershed to save them and avoid early release.

In the event of a natural catastrophe, dam boards and screens are pulled and the fish are released irrespective of their tagging status or size.

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.

Releases will occur in May, within the normal seaward migration time for natural-origin ocean-type Chinook salmon in the South Fork Stillaguamish River.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

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

Management Issues and Questions	Performance Standard	Performance Indicator	Comments – Monitoring program requirements
Are the program benefits being achieved?			

Management Issues and Questions	Performance Standard	Performance Indicator	Comments – Monitoring program requirements
What are the measures of success for the program?	Achieve a natural origin (NOR) escapement of 400 fish for four consecutive years.	Estimate escapement of early Chinook by origin (hatchery or natural spawner) in South Fork	3. Estimation of total escapement a. Survey method, counting spawning fish b. Broodstock counted as sampled 4. Estimate hatchery vs. natural origin spawners' a. All hatchery fish are cwt only b. spawning fish are sampled for tags.
Is the hatchery program providing a buffer for catastrophic events in habitat during duration of NOR in freshwater?	The recruits per spawner for the hatchery origin Chinook are above 2.0.	Estimate the recruits per spawner for natural and hatchery origin fish.	4. Estimation of total return and location of spawning for each group, hatchery and natural origin 5. requires a tag group and estimation of exploitation rates Hatchery fish are tagged 6. All fisheries and spawning escapement sampled
	The natural smolts per spawner is monitored	Estimate index of abundance of natural smolts per spawner for natural origin Chinook	3. Juvenile trap provides an estimate of abundance of outmigrating natural smolts. 4. Natural and hatchery origin smolts can be separated due to mark on hatchery fish.
What are the genetic effects on the naturally spawning population?			
How is effective population size and genetic diversity affected?	Contribution rates of hatchery origin adults to the naturally spawning population are representative of total population.	Estimate contribution rate of hatchery adult returns to naturally spawning population	4. Mark on all hatchery releases 5. Sample spawning population for marked fish 6. Estimate total escapement
	Contribution rates of natural origin adults to the broodstock are representative of total population.	Estimate contribution rate of hatchery adult returns to hatchery broodstock.	3. Mark on all hatchery releases 4. Sample broodstock for marked fish
	Genetic diversity of the composite spawning population is maintained.	Estimate genetic diversity for hatchery broodstock and naturally spawning populations.	Indicators for genetic diversity in the hatchery and natural populations will be measured using microsatellites.
Are rearing and release strategies producing fish that will be successful in the wild?			

Management Issues and Questions	Performance Standard	Performance Indicator	Comments – Monitoring program requirements
Hatchery operations are successful	Egg to release survival is over 70%, and total production is 45,000.	Estimate egg to release survival in hatchery	In-Hatchery monitoring plan
Are hatchery fish in the same health condition as wild fish at release	Hatchery fish are in the same health condition as wild fish	Monitor health of hatchery and wild fish	1. Wild fish are sampled at smolt trap (up to 50 smolts) 2. NWIFC also monitors hatchery fish health monthly.
Do hatchery and natural origin Chinook have similar life history and morphological characteristics?	Size composition of hatchery releases are similar to the natural origin juveniles	Estimate the size distribution of hatchery and natural juveniles and test the null hypothesis that they are not significantly different.	4. Measure juveniles prior to release 5. Sample and measure natural and program origin juveniles, at smolt trap
	Time of release and outmigration are similar for hatchery and natural origin juveniles	Estimate the mean and variance of outmigration for both components of the total outmigration and test the hypothesis that there is no difference.	2. Sample at smolt trap juveniles during outmigration for tags.
		Estimate the proportion of natural and hatchery origin fish that are yearling	3. Estimate % outmigrants that are yearling by size, and estimate % yearling that are program fish by wanding. 4. Estimate % yearling in adult return using scales, and estimate % that are hatchery origin wanding. .
	Age and sex composition of adult returns are similar to the natural origin adults	Estimate the age and sex composition of hatchery and natural adult returns and test the null hypothesis that they are not significantly different.	1. Sample hatchery and adult returns for age and sex status. Requires a weighted sampling scheme as broodstock and spawning adults are sampled separately. 2. Identify all hatchery fish by tag status.
	Time of adult spawning of hatchery and natural origin adults are similar	Estimate the mean and variance of adult spawning time for hatchery and natural origin fish and test the null hypothesis that they are not significantly different.	Use carcass sampling to estimate spawning times for spawners on the spawning grounds.
	Hatchery and natural origin Chinook are distributing over same areas for spawning	Estimate the proportional distribution of hatchery and natural origin spawning adults and test the hypothesis that they are not significantly different.	3. Spawner surveys collect tag data by reach in the river 4. Hatchery origin fish are marked

Management Issues and Questions	Performance Standard	Performance Indicator	Comments – Monitoring program requirements
Is the broodstock collected so that life-history traits are preserved?	The age, sex and size compositions of the broodstock are similar to the total escapement.	Estimate the age and sex composition of hatchery and natural origin broodstock and test the null hypothesis that they are not significantly different. .	4. All hatchery origin fish are marked 5. All broodstock are sampled for age and sex by origin. 6. Spawning surveys collect data on age, sex, size and location.
Are there impacts on other Chinook populations?			
What is the stray rate to North Fork Chinook spawning areas?	The North Fork Chinook spawners are not impacted by South Fork hatchery returns	Estimate the contribution of SF early to NF early	2. Requires sampling of NF Chinook spawners

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

Commitments have been made by the co-managers to supply the manpower required for collection of the brood stock, incubation and early rearing. A project to provide the additional resources required to support the full operation of the program has been submitted to the Salmon Recovery Funding Board. Additional grant sources are being explored.

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.

All operations in the hatchery and in the sampling efforts during river migration will be conducted in a manner that will minimize any adverse genetic and ecological effects to the listed fish. All sampling will be conducted on a random basis to avoid bias. The numbers handled once the fish are released are expected to be in the range of 2-4% of the population and little or no mortality is expected in monitoring and evaluation activities.

Field staff will utilize an outmigrant smolt trap to evaluate differences between Chinook hatchery and wild outmigrants. The smolt trap will be operated to minimize stress and mortalities to
Chinook and other species. The trap will be checked frequently, large predators will be removed first and then Chinook will be anesthetized for handling and replaced in recovery tanks prior to release.

SECTION 12. RESEARCH

12.1) Objective or purpose.

Spawning ground surveys to determine effective female spawners for the purpose of

evaluating survival rates of hatchery and natural origin spawners. If feasible, mark recapture studies on the fish will be conducted to provide validation of current spawning ground population estimates.

Scale samples will be taken during spawner ground surveys to expand the database on the age composition of the returning fish and the age at migration.

12.2) Cooperating and funding agencies.

Washington Department of Fish and Wildlife
Stillaguamish Indian Tribe
Northwest Indian Fish Commission
Pacific Salmon Commission
NOAA Fisheries
Stillaguamish Implementation and Review Committee
Stillaguamish Technical Assessment Group

12.3) Principle investigator or project supervisor and staff.

John Drotts, Natural Resources Manager for the Stillaguamish Tribe
Kip Killebrew, Stillaguamish Tribe Fisheries Biologist
Kevin Gladsjo, Stillaguamish Tribe Hatchery Manager
Kelly Baker, Stillaguamish Tribe Fisheries Technician
Craig Olson, NWIFC fish pathologist.

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

The Chinook stocks sampled will all likely be in critical status.

Sampling in the river situations will be non-lethal, unless absolutely necessary to collect fish health or information required to determine stock identity.

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

Possible electro-fishing, and chemical anesthetics may be used to sample fish.

Screw Trap sampling will occur on the main stem Stillaguamish.

All Chinook will be anesthetized with MS222 prior to measurement, DNA tissue sampling or coded wire tag.

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

Sampling may be expected to take place between August and October for adult sampling and January to June for outmigrant sampling.

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

No live fish will be transported.

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

Based on past experience the expected take would be:

Less than 50 fry for wild disease sampling, and up to 1000 outmigrants for non-lethal DNA fin clips for stock identification. Tagged Chinook captured in the SF during the first 3 years will be killed to collect stray information and to reduce the amplification of their DNA in the spawning process.
.

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).
Information contained in Table 1.

12.10) Alternative methods to achieve project objectives.

The alternatives methods for investigating the relative stock composition of the North and South Fork Stillaguamish to total production would require an extensive mark recapture program on naturally spawned juveniles and this approach is not technically feasible at this time.

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

Listed Bull trout and steelhead outmigrants may be captured and handled at the smolt trap. Mortalities of these species have been less than .5% because of the low number of individuals captured in the smolt trap.

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.

All research activities will follow best management practices for gear operation and fish handling to minimize unintended mortality.

SECTION 13. ATTACHMENTS AND CITATIONS

NMFS. 2004. Evaluation and recommended determination of a resource management plan (RMP); Puget Sound comprehensive Chinook management plan, harvest management component. Puget Sound Treaty Tribes and Washington Department of Fish and Wildlife. Sustainable Fisheries Division, NMFS. 63p.

Northwest Indian Fisheries Commission (NWIFC) and Washington Department of Fish and Wildlife (WDFW). 1998. Salmonid disease control policy of the fisheries co-managers of Washington State. Fish Health Division, Fish Program. Washington Department Fish and Wildlife, Olympia, WA. 22 p.

Puget Sound Indian Tribes (PSIT) and Washington Department of Fish and Wildlife (WDFW). 2003. Puget Sound comprehensive Chinook management plan; harvest management component. February 19, 2003. 239p (including appendices).

Puget Sound Salmon Management Plan (PSSMP). 1985. *United States* v. *Washington*, 384 F. Supp. 312; sub no. 85-2 (W.D. Wash.), Seattle, WA.

Puget Sound Technical Recovery Team (PS TRT). 2003a. Independent populations of Chinook salmon in Puget Sound. Final draft. July 22, 2003. Northwest Fisheries Science Center. National Marine Fisheries Service. Seattle, Washington. 40 p.

Puget Sound Technical Recovery Team (PS TRT). 2003b. Triangulation of delisting criteria: combining demographic and habitat-based approaches to set recovery goals for Puget Sound Chinook salmon populations. Draft, October 10, 2003. Northwest Fisheries Science Center. National Marine Fisheries Service. Seattle, Washington. 40 p.

Stillaguamish Tribe. 2005. Hatchery and genetic management plan – North Fork Stillaguamish Chinook Natural Stock Restoration Program. August 2005 draft.

WDFW and PSTT (Puget Sound Treaty Tribes). 2004. Puget Sound Chinook salmon hatcheries, a component of the comprehensive Chinook salmon management plan. March 31, 2004. Northwest Indian Fisheries Commission. Lacey, WA. 148p.

SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the information provided is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by_____ Date: 1\4\2006_____
Tribal Chair,
Stillaguamish Tribe

Table 1. Estimated listed salmonid take levels of by hatchery activity/Smolt trap.

Listed species affected: *Oncorhynchus tshawytscha* **ESU/Population:** Puget Sound **Activity:Hatchery/Smolt Trap**				
Location of hatchery activity: South Fork Stillaguamish **Dates of activity:** Year Round **Hatchery program operator:** Stillaguamish Tribe				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)			100-400	100-400
Collect for transport b)			30	
Capture, handle, and release c)		1000-2000	100-400	
Capture, handle, tag/mark/tissue sample, and release d)		1000-60,000		100-400
Removal (e.g. broodstock) e)			10-30	
Intentional lethal take f)		100-1000	10-30	
Unintentional lethal take g)	6,000-12,000	3,000-10,000	0-5	
Other Take (specify) h)				

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.

Instructions:

1. An entry for a fish to be taken should be in the take category that describes the greatest impact.
2. Each take to be entered in the table should be in one take category only (there should not be more than one entry for the same sampling event).
3. If an individual fish is to be taken more than once on separate occasions, each take must be entered in the take table.

Attachment 1. Definition of terms referenced in the HGMP template.

Augmentation - The use of artificial production to increase harvestable numbers of fish in areas where the natural freshwater production capacity is limited, but the capacity of other salmonid habitat areas will support increased production. Also referred to as "fishery enhancement".

Critical population threshold - An abundance level for an independent Pacific salmonid population below which: depensatory processes are likely to reduce it below replacement; short-term effects of inbreeding depression or loss of rare alleles cannot be avoided; and productivity variation due to demographic stochasticity becomes a substantial source of risk.

Direct take - The intentional take of a listed species. Direct takes may be authorized under the ESA for the purpose of propagation to enhance the species or research.

Evolutionarily Significant Unit (ESU) - NMFS definition of a distinct population segment (the smallest biological unit that will be considered to be a species under the Endangered Species Act). A population will be/is considered to be an ESU if 1) it is substantially reproductively isolated from other conspecific population units, and 2) it represents an important component in the evolutionary legacy of the species.

Harvest project - Projects designed for the production of fish that are primarily intended to be caught in fisheries.

Hatchery fish - A fish that has spent some part of its life-cycle in an artificial environment and whose parents were spawned in an artificial environment.

Hatchery population - A population that depends on spawning, incubation, hatching or rearing in a hatchery or other artificial propagation facility.

Hazard - Hazards are undesirable events that a hatchery program is attempting to avoid.

Incidental take - The unintentional take of a listed species as a result of the conduct of an otherwise lawful activity.

Integrated harvest program - Project in which artificially propagated fish produced primarily for harvest are intended to spawn in the wild and are fully reproductively integrated with a particular natural population.

Integrated recovery program - An artificial propagation project primarily designed to aid in the recovery, conservation or reintroduction of particular natural population(s), and fish produced are intended to spawn in the wild or be genetically integrated with the targeted natural population(s). Sometimes referred to as "supplementation".

Isolated harvest program - Project in which artificially propagated fish produced primarily for harvest are not intended to spawn in the wild or be genetically integrated with any specific natural population.

Isolated recovery program - An artificial propagation project primarily designed to aid in the recovery, conservation or reintroduction of particular natural population(s), but the fish produced are not intended to spawn in the wild or be genetically integrated with any specific natural population.

Mitigation - The use of artificial propagation to produce fish to replace or compensate for loss of fish or fish production capacity resulting from the permanent blockage or alteration of habitat by human activities.

Natural fish - A fish that has spent essentially all of its life cycle in the wild and whose parents spawned in the wild. Synonymous with *natural origin recruit (NOR).*

Natural origin recruit (NOR) - See *natural fish*.

Natural population - A population that is sustained by natural spawning and rearing in the natural habitat.

Population - A group of historically interbreeding salmonids of the same species of hatchery, natural, or unknown parentage that have developed a unique gene pool, that breed in approximately the same place and time, and whose progeny tend to return and breed in approximately the same place and time. They often, but not always, can be separated from another population by genotypic or demographic characteristics. This term is synonymous with stock.

Preservation (Conservation) - The use of artificial propagation to conserve genetic resources of a fish population at extremely low population abundance, and potential for extinction, using methods such as captive propagation and cryopreservation.

Research - The study of critical uncertainties regarding the application and effectiveness of artificial propagation for augmentation, mitigation, conservation, and restoration purposes, and identification of how to effectively use artificial propagation to address those purposes.

Restoration - The use of artificial propagation to hasten rebuilding or reintroduction of a fish population to harvestable levels in areas where there is low, or no natural production, but potential for increase or reintroduction exists because sufficient habitat for sustainable natural production exists or is being restored.

Stock - (see “Population”).

Take - To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

Viable population threshold - An abundance level above which an independent Pacific salmonid population has a negligible risk of extinction due to threats from demographic variation (random or directional), local environmental variation, and genetic diversity changes (random or directional) over a 100-year time frame.

Attachment 2. Age class designations by fish size and species for salmonids released from hatchery facilities.

(generally from Washington Department of Fish and Wildlife, November, 1999).

SPECIES/AGE CLASS	SIZE CRITERIA Number of fish/pound	SIZE CRITERIA Grams/fish
• Chinook Yearling	<=20	>=23
• Chinook (Zero) Fingerling	>20 to 150	3 to <23
• Chinook Fry	>150 to 900	0.5 to <3
• Chinook Unfed Fry	>900	<0.5
• Coho Yearling 1/	<20	>=23
• Coho Fingerling	>20 to 200	2.3 to <23
• Coho Fry	>200 to 900	0.5 to <2.3
• Coho Unfed Fry	>900	<0.5
• Chum Fed Fry	<=1000	>=0.45
• Chum Unfed Fry	>1000	<0.45
• Sockeye Yearling 2/	<=20	>=23
• Sockeye Fingerling	>20 to 800	0.6 to <23
• Sockeye Fall Releases	<150	>2.9
• Sockeye Fry	> 800 to 1500	0.3 to <0.6
• Sockeye Unfed Fry	>1500	<0.3
• Pink Fed Fry	<=1000	>=0.45
• Pink Unfed Fry	>1000	<0.45
• Steelhead Smolt	<=10	>=45
• Steelhead Yearling	<=20	>=23
• Steelhead Fingerling	>20 to 150	3 to <23
• Steelhead Fry	>150	<3
• Cutthroat Trout Yearling	<=20	>=23
• Cutthroat Trout Fingerling	>20 to 150	3 to <23
• Cutthroat Trout Fry	>150	<3
• Trout Legals	<=10	>=45
• Trout Fry	>10	<45

1/ Coho yearlings defined as meeting size criteria and 1 year old at release, and released prior to June 1st.
2/ Sockeye yearlings defined as meeting size criteria and 1 year old.