HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	Hamma Hamma Fall Chinook Supplementation Program
Species or Hatchery Stock	Hamma Hamma Fall Chinook (*Oncorhynchus tshawytscha*) George Adams Hatchery Fall Chinook
Agency/Operator	Long Live the Kings Hood Canal Salmon Enhancement Group Washington Department of Fish and Wildlife
Watershed and Region	Hood Canal, Puget Sound
Date Submitted	August 04, 2005
Date Last Updated	July 25, 2005

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Hamma Hamma Fall Chinook Restoration

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

Fall Chinook, *Oncorhynchus tshawytscha*, Hamma Hamma Chinook Stock, ESA status is threatened as part of Puget Sound Chinook ESU

Fall Chinook, *Oncorhynchus tshawytscha*, George Adams Hatchery stock, ESA status is threatened as part of Puget Sound Chinook ESU

1.3) Responsible organizations and individuals

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

U.S. Fish and Wildlife Service (USFWS) provides funding, project planning and overview; Washington Department of Fish and Wildlife (WDFW) provides funding, project planning and overview; Point No Point Treaty Council (PTPTC) provides project planning and overview; Port Gamble S'Klallam tribes provide project planning, data collection and staff; Skokomish Tribe provides project planning, data collection and staff.

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

Funding for this project is from these sources:

LLTK: USFWS, LLTK Private Donations. Staffing is two full time paid staff at Lilliwaup. Annual operating costs are approximately $172,000.
HSCEG: USFWS, WDFW, People for Salmon, Mason Conservation District. Significant volunteer involvement is involved. Project operational costs using volunteer labor are currently undetermined.

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

Broodstock Collection; :
Conservancy site is located on Johns Creek (WRIA 16.0253), RM 2.0 in the Hamma Hamma River basin.
George Adams Hatchery is located on Purdy Creek (WRIA 16.0005) in the Skokomish River basin.

Incubation and Rearing:
Lilliwaup Hatchery is located further south on Hood Canal, T23N, R03W, and Sec.19, WRIA 16.

George Adams Hatchery is located on Purdy Creek (WRIA 16.0005) in the Skokomish River basin.

Conservancy site is located on Johns Creek (WRIA 16.0253), RM 2.0 in the Hamma Hamma River basin.

Release:
Conservancy site is located on Johns Creek (WRIA 16.0253), RM 2.0 in the Hamma Hamma River basin.

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

1.7) Purpose (Goal) of program.

Restoration. The goal of this program is to restore a healthy, natural, self-sustaining population of fall chinook to the Hamma Hamma River.

An intent of the program is (1) to boost the numbers of naturally produced chinook in the Hamma Hamma River using chinook adults returning to the Hamma Hamma River and George Adams Hatchery as the donor broodstock(s); and (2) to foster the development of the chinook stock adapting to the Hamma Hamma River by reducing the use of George Adams Hatchery chinook and transitioning to the use of Hamma Hamma chinook as broodstock (benefit/risk analysis and recommendations developed by NMFS, WDFW and PNPTC (dated September 15, 2000)). A technical workgroup, including NOAA Fisheries, will be convened to discuss and decide on when during the program to use the broodstock(s).

1.8) Justification for the program.

Spawning escapement of chinook in the Hamma Hamma has been low for a relatively long period of time. Restoration through the conservancy site began in 1995 and has contributed to escapements of 172, 557, 381, 248, 32, 95 and 49 naturally spawning chinook in 1998, 1999, 2000, 2001, 2002, 2003 and 2004, respectively. The intent is that this program will be of short duration (12 years maximum) and will be undertaken in a manner that does not jeopardize the listed restoration of ESA-listed chinook in Hood Canal.

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

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

Potential Hazard	**HGMP Reference**	**Risk Aversion Measures**
Water Withdrawal	4.1	The water source at Johns Creek is several groundwater springs and is specific pathogen-free; the water quality is consistent in temperature and amount with year around temperature ranging from 46 - 50 degrees.
Intake Screening	4.2	No screens involved
Effluent Discharge	4.2	The Johns Creek facility will produce a relatively small amount of fish each year, and well under the 20,000 pounds per year criteria set by WDOE as the limit for concern regarding hatchery effluent discharge effects and for the requirement for an NPDES permit.
Broodstock Collection & Adult Passage	7.9, 2.2.3	Listed chinook are collected for broodstock. Protocols and guidelines set forth by the USFWS, WDFW and the tribes shall be followed to ensure minimal harm to listed fish; fish not used as broodstock, returned to the Hamma Hamma River.
Disease Transmission	2.2.3, 9.2.7	Co-Managers Fish Disease Policy. Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases.
Competition & Predation	2.2.3, 10.11	See sections 2.2.3 & 10.11

Note: For Broodstock collection and facilities info see: George Adams Fall Chinook HGMP, Long Live the Kings- Lilliwaup Summer Chum HGMP.

1.9) List of program "Performance Standards".

The goal of this program is to restore a healthy, natural, self-sustaining population of fall chinook to the Hamma Hamma River.

The following are objectives for the restoration program on the Hamma Hamma River chinook stock :

Objective 1: Restore and maintain population comprised of naturally spawning chinook on the Hamma Hamma River.

Objective 2: Boost the numbers of naturally produced chinook in the Hamma Hamma River using chinook adults returning to the Hamma Hamma River and George Adams Hatchery as the donor stocks. Foster the recovery and development of the chinook stock adapting to the Hamma Hamma River by reducing the use of George Adams Hatchery chinook and transitioning to the use of Hamma Hamma chinook as broodstock. Produce about 110,000 fingerlings each year for release into the Hamma Hamma River (with fry from each of the Hamma Hamma and/or George Adams donor stocks, as appropriate – see section 6.0).

Objective 3: Monitor and evaluate the effectiveness of the restoration program (see 1.10 below). Report the results of the program each year.

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

This program will be evaluated and monitored for the effects on restoration by addressing the following four elements:

1. The estimated contribution of the restoration program-origin chinook to the naturally spawning population during the recovery process;

2. Changes in the genetic, phenotypic, or ecological characteristics of populations (target & non-target) affected by the restoration program;

3. The need and methods for improvement of restoration activities in order to meet program objectives, or the need to discontinue a program because of failure to meet objectives; and

4. Determination of when restoration has succeeded and is no longer necessary for recovery.

1.10.1) "Performance Indicators" addressing benefits.

Funding, staffing, and support are available and committed for current Monitoring and Evaluation as described in Section 11.1; additional funds may be needed for data collection and compilation, and to support allozyme, DNA and otolith collections and analyses.

Element 1: Estimate the contribution of restoration program-origin chinook to the naturally spawning population during the recovery process.

1. Differentially mark all hatchery-origin fall chinook fry to allow for distinction from natural-origin fish upon return as adults on the spawning grounds. This will be accomplished by otolith (thermal) marking and adipose fin clipping, or another permanent, effective method determined by the Co-Managers.

2. Conduct spawning ground surveys throughout the fall chinook return to enumerate spawners, and to collect information regarding fish origin (via random sampling of fish heads for otoliths), and age class composition through scale sampling.

3. Estimate the number of naturally spawning hatchery-origin fall chinook contributing to each restoration population's annual escapement.

4. Estimate the number of natural production of juveniles by operation of a smolt (e.g., screw) trap.

Element 2: Collect and evaluate information on adult returns.

Commencing with the first year returns of progeny from naturally spawned, hatchery-origin chinook (2001), evaluate results of spawning ground surveys and age class data collections to:

a. Estimate the abundance and trends in abundance of spawners;

b. Estimate the proportion of the escapement comprised by chinook of hatchery lineage and naturally spawning lineage;

c. Through mark sampling, estimate brood year contribution for hatchery lineage and naturally spawning lineage.

Using the above information, determine whether the population has declined, remained stable, or has been recovered to sustainable levels. The ability to estimate hatchery and naturally spawned proportions will be determined by implementation plans, budgets, and assessment priorities.

1.10.2) Performance Indicators addressing risks.

Funding, staffing, and support are available and committed for current Monitoring and Evaluation as described in Section 11.1; additional funds may be needed for data collection and compilation, and to support allozyme, DNA and otolith collections and analyses.

Element 1: Estimate the contribution of restoration program-origin chinook to the naturally-spawning population during the recovery process

1. Monitor escapements of non-restoration populations to determine the level of straying of restoration program-origin fish to other drainages. This monitoring should be linked to a broader effort addressing Hood Canal hatchery chinook straying.

Element 2: Collect and evaluate information on adult returns.

This element will be addressed through consideration of the results of Elements 1., above, and 3., below, and through the collection of information required under adaptive criteria that will be used as the basis for determining when to stop a restoration or reintroduction program.

1. Collect age, sex, length, average egg size, and fecundity data from a representative sample of broodstock used in each restoration program for use as baseline data to document any phenotypic changes in the populations.

2. Compare newly acquired electrophoretic analysis data reporting allele frequency variation of returning hatchery and wild fish with baseline genetic data. Determine if there is evidence of
loss of genetic variation (not expected from random drift) that may have resulted from the restoration program.

Element 3: Monitor and evaluate any changes in the genetic, phenotypic, or ecological characteristics of the populations presently affected by the restoration program.

1. Determine the pre-spawning and green egg to released fry survivals for each program at various life stages.

a. Monitor growth and feed conversion for chinook fry.
b. Determine green egg to eyed egg, eyed egg to swim-up fry, and swim-up fry to released fry survival rates for chinook.
c. Maintain and compile records of cultural techniques used for each life stage, such as: collection and handling procedures, and trap holding durations, for chinook broodstock; fish and egg condition at time of spawning; fertilization procedures, incubation methods/densities, temperature unit records by developmental stage, shocking methods, and fungus treatment methods for eggs; ponding methods, start feeding methods, rearing/pond loading densities, feeding schedules and rates for juveniles; and release methods for fed fry.
d. Summarize results of tasks for presentation in annual reports.
e. Identify where the restoration program is falling short of objectives, and make recommendations for improved fish culture as needed.

2. Determine if broodstock procurement methods are collecting the required number of adults that represent the demographics of the donor population with minimal injuries and stress to the fish.

a. Monitor operation of adult collecting operations, ensuring compliance with established broodstock collection protocols for each station.
b. Monitor timing, duration, composition, and magnitude of each run at each adult collection site.
c. Maintain daily records of collection operation and maintenance (e.g. time of collection), number and condition of fish caught, and environmental conditions (e.g. river stage, tide, water temperature).
d. Collect biological information on collection-related mortalities, if any. Determine causes of mortality, and use carcasses for stock profile sampling, if possible.
e. Summarize results for presentation in annual reports. Provide recommendations on means to improve broodstock collection, and refine protocols if needed for application in subsequent seasons.

3. Monitor fish health, specifically as related to cultural practices that can be adapted to prevent fish health problems. Professional fish health specialists supplied by WDFW will monitor fish health.

a. Fish health monitoring will be conducted by a Fish Health Specialist. Significant fish mortality to unknown causes will be sampled for histo-pathological study.
b. The incidence of viral pathogens in chinook broodstock will be determined by sampling fish at spawning in accordance with procedures set forth in Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State (NWIFC and WDFW, 1998).
c. Recommendations on fish cultural practices will be provided, based upon the fish health condition of chinook fry.
d. Fish health monitoring results will be summarized in an annual report.

1.11) Expected size of program.

The program will be consistent with the understandings (1) presented in letters from: LLTK and HCSEG (dated September 26,2001), NMFS (dated October 19, 1999 and November 16, 2000), WDFW (dated September 18, 2000), and the broodstock benefit/risk analysis and recommendations developed by NMFS, WDFW and PNPTC (dated September 15, 2000); and (2) with updated understandings of the program technical workgroup, including NOAA Fisheries.

An intent of the program is (1) to boost the numbers of naturally produced chinook in the Hamma Hamma River using chinook adults returning to the Hamma Hamma River and George Adams Hatchery as the donor broodstocks.; and (2) to foster the development of the chinook stock adapting to the Hamma Hamma River by reducing the use of George Adams Hatchery chinook and transitioning to the use of Hamma Hamma chinook as broodstock. A technical workgroup, including NOAA Fisheries, will be convened to discuss and decide on the use of the two broodstocks, as necessary.

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

Collect about 120,000 eggs from approximately 40 pairs of natural chinook adults returning to the Hamma Hamma River and/or to George Adams Hatchery.

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

Proposed fish release levels are currently based on the available flows (gpm) and volumes (ft3) at the rearing sites on John Creek and the estimated production capacities for chinook at the sites. Other rearing strategies and production levels are under consideration by the program technical work group, including NOAA Fisheries. For example, (1) rearing fish at other hatchery facilities in Hood Canal prior to transfer to the John Creek sites and (2) basing fish release levels on the natural production capacity of chinook juveniles in the Hamma Hamma River are being considered.

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Fingerling	Johns Creek (WRIA 16.0253)	110,000
Yearling (smolt)		

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

The program began with brood year (BY) 1995 and has produced chinook adults that contributed to total escapements of 172, 557, 381, 248, 32, 95 and 49 naturally spawning chinook in 1998, 1999, 2000, 2001, 2002, 2003 and 2004, respectively. Total smolt to adult survival data is unavailable (fishery impact on these fish is unknown). Smolt to escapement survival rates were about 0.4% to 1% for BY 1995 through BY 1998 and about 0.1% to 0.2% for BY 1998 through BY2000 Recent escapements and survival rates are a concern and a technical workgroup, including NOAA Fisheries, will be convened to evaluate, discuss, and decide on modifications for the program.

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

Program started in 1995.

1.14) Expected duration of program.

Program is expected to last for a maximum of 12 years.

1.15) Watersheds targeted by program.

Hamma Hamma River (WRIA 16.0251), Hood Canal

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

The Puget Sound Salmon Management Plan (PSSMP) (1985) and the Hood Canal Salmon Management Plan (HCSMP) are federal court orders that currently control both the harvest management rules and production schedules for salmon in Hood Canal under the *U.S. v. Washington* management framework. The parties to the SCSCI recognize that the PSSMP explicitly states that "no change may be made to the Equilibrium Brood Document (production goals) without prior agreement of the affected parties." This program operates within the overview of a technical workgroup comprised of representatives of NMFS, WDFW, USFWS, Point-no-Point Treaty Council, Skokomish Tribe, HCSEG, and LLTK.

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

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

This program was included in a Section 7 consultation through the U.S. Fish and Wildlife Service in early 2000, which required a draft HGMP. The program is part of the Wild Chinook Conservancy Project approved by state, federal and tribal agencies.

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

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

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

Puget Sound ESU Chinook (Skokomish Chinook; mid-Hood Canal Chinook (draft SaSI, WDFW unpublished, 2003))

Watersheds flowing into Hood Canal from the west, draining out of the Olympic Mountains, are high gradient rivers with limited access to anadromous fish due to natural barriers; major watersheds include the Hamma Hamma, Duckabush and Dosewallips rivers. Watersheds flowing into Hood Canal from the east, off the Kitsap Peninsula, are lower gradient, smaller systems; these include the Union, Dewatto and Tahuya rivers. The Skokomish River, including the South and North forks, is the largest watershed and enters Hood Canal from the southwest. In Hood Canal, most natural chinook spawning occurs in the Skokomish River (including the South and North forks) (Skokomish chinook), with smaller populations in the Dosewallips, Duckabush and Hamma Hamma rivers (mid-Hood Canal chinook). Small numbers of chinook spawners have been periodically observed in the Union, Dewatto and Tahuya rivers, but it is unknown whether these streams historically supported naturally sustainable chinook populations.

We have little information on the adult age structure, sex ratio, size range or smolt distribution and emigration timing of wild chinook in Hood Canal streams. We do not know if Hood Canal hatchery-origin fingerling fall chinook interacts with wild Hood Canal chinook. Hood Canal wild Chinook are thought to emigrate mainly as sub-yearlings, probably from April through early June. The summer flows in the South Fork Skokomish River may be too low to support chinook through the summer, though some areas in the Lower North Fork do have sufficient water (C. Baranski, WDFW, personal communication, March 2000). Hood Canal fall chinook spawn from mid-September through October with a peak in mid-October (WDF, WDG and WWTIT, 1992). Chinook spawning occurs in the mainstem Skokomish River, the lower South Fork Skokomish and tributaries such as Vance Creek, lower North Fork Skokomish and tributaries, and the lower reaches (below anadromous barriers) of Lilliwaup Creek, John Creek, the Duckabush, Dosewallips, Big and Little Quilcene Rivers, and the lower Union, Tahuya and Dewatto rivers. Chinook spawning in many of these streams may be largely the result of hatchery releases.

SaSI (draft, WDFW unpublished 2003) classified Hood Canal summer/fall chinook as two stocks (see above) of mixed origin (both native and non-native) with composite production (sustained by wild and artificial production) (WDF et al., 1992). The combination of recent low abundances (in all tributaries except the Skokomish River) and widespread use of hatchery stocks (primarily originating from sources outside Hood Canal) led to the conclusion in SASSI (1992) that there were no remaining genetically unique, indigenous populations of chinook in Hood Canal. However, a sampling effort is currently under way (led by WDFW in cooperation with NOAA Fisheries and Treaty Tribes) to collect genetic information from chinook juveniles and adults in the tributaries of Hood Canal. This investigation is intended to provide further information on the genetic source and status of existing chinook populations. The current distinction between these two populations is based on spawning distribution (draft SaSI, WDFW unpublished 2003).

Genetic characterization of the Skokomish chinook stocks has, to date, been limited to comparison of adults and juveniles collected from the Skokomish River with adults from other Hood Canal and Puget Sound populations. Genetic collections were made during 1998 and 1999 in the Skokomish River and there appeared to be no significant genetic differentiation between natural spawners and the local hatchery populations. It appears that Hood Canal area populations may have formed a group differentiated from south Puget Sound populations, possibly indicating that some level of adaptation may be occurring following the cessation of transfers from south Puget Sound hatcheries (Anne Marshall, WDFW memo dated May 31, 2000). Current adult returns are a composite of natural- and hatchery-origin fish. During 1998 and 1999, known hatchery-origin fish comprised from 13% to 41% of the samples collected on the natural spawning grounds. Genetic analysis of samples collected from Lake Cushman was inconclusive as to stock origin, and exhibits low genetic variability (Ann Marshall, WDFW memo dated April 14, 1995).

Genetic characterization of the mid-Hood Canal stocks has, to date, been limited to comparison of adults returning to the Hamma Hamma River in 1999 with other Hood Canal and Puget Sound populations. These studies, although not conclusive, suggest that Hamma Hamma returns are not genetically distinct from the Skokomish River returns, or recent George Adams and Hoodsport hatchery broodstock (A. Marshall, WDFW unpublished data). The reasons for this similarity are unclear, but straying of chinook that originate from streams further south in Hood Canal, and hatchery stocking, could be contributing causes. Analysis of GSI collections made during 2002 is pending.

Because there is no specific information on wild smolt temporal and spatial distribution in Hood Canal streams, the extent to which they might interact with hatchery chinook released locally is unknown.

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

Hood Canal Summer Chum:

The following is paraphrased from life history information for Hood Canal and Strait of Juan de Fuca summer chum presented in the Summer Chum Salmon Conservation Initiative (SCSCI) (WDFW et al., 2000):

Hood Canal and Strait of Juan de Fuca summer chum populations are one of three genetically distinct lineages of chum salmon in the Pacific Northwest region; and were designated as an evolutionary significant unit (ESU) based upon distinctive life history and genetic traits. The uniqueness of the summer chum life history is best characterized by their late summer entry into freshwater spawning areas, and their late winter/early spring arrival in the estuaries as seaward-migrating juveniles. A significantly different migration and escapement timing and geographic separation from other chum stocks have afforded reproductive isolation.

Summer chum spawning occurs from late August through late October. Eggs eye in redds after about 4 to 6 weeks incubation and hatch about 8 weeks after spawning. Fry emerge from redds, usually with darkness, between February and late May and immediately commence migration downstream to estuarine areas. Summer chum fry initially inhabit nearshore areas and occupy sub-littoral sea grass beds for about one week and are thought to be concentrated in the top few meters of the water column both day and night. Upon reaching a size of 45-50 millimeters (mm), fry move to deeper offshore areas. Migrating at a rate of 7-14 kilometers (km) per day, the southernmost out-migrating summer chum fry population in Hood Canal would exit the Canal 14 days after entering seawater (90% of population exits by April 28 each year, on average); and Strait of Juan de Fuca summer chum would exit the Discovery Bay area 13 days after entering seawater (90% completion by June 8 each year, on average).

In the Summer Chum Salmon Conservation Initiative (SCSCI) (WDFW and PNPTT 2000), the most recent information on historical and current summer chum salmon distribution and on the genetic profiles of the populations has been reviewed. This analysis has resulted in an updated list of 16 summer chum stocks, which form the basic population units used throughout the recovery plan. Six current summer chum stocks have been identified in Hood Canal: Quilcene, Dosewallips, Duckabush, Hamma Hamma, Lilliwaup, and Union. Six additional stocks are identified as recent extinctions: Skokomish, Finch, Tahuya, Dewatto, Anderson, and Big Beef. In the Strait of Juan de Fuca, three currently existing stocks have been identified: Snow/Salmon, Jimmycomelately, and Dungeness. Chimacum is noted as a recent stock extinction.

In Hood Canal streams, the continuous and cumulative reduction in habitat productivity and capacity has influenced summer chum salmon by lowering survival rates and population resiliency, and reducing potential population size. Net fisheries in Hood Canal, when combined with harvests in Puget Sound and the Strait of Juan de Fuca, began to catch a high

percentage of returning summer chum salmon in 1980, contributing to low escapements through the 1980s. At the same time, oceanic climate changes influenced regional weather patterns, resulting in unfavorable stream flows during the winter egg incubation season. Fall spawning flows dropped substantially in 1986 (also likely climate related), contributing to the poor status of these stocks. The current low production of Hood Canal summer chum salmon appears to be the result of the combined effects of lower survivals caused by habitat degradation, climate change and increases in harvest. The Summer Chum Conservation Initiative (SCSCI) requires that no hatchery fish releases are to occur prior to April 1 as a protection measure during out-migration of listed Hood Canal summer chum.

The pattern of decline of summer chum salmon in Strait of Juan de Fuca streams is similar to the Hood Canal experience, however, the drop in escapements occurred ten years later, in 1989. The combined effects of reductions in habitat quality, stream flows, and fishery harvests have resulted in low summer chum salmon production in the Strait of Juan de Fuca region.

There have been a number of factors that are positive for summer chum salmon recovery. One is the successful reduction in harvests within Hood Canal fishing areas, averaging less than 2% of the runs during the 1993-1997 seasons. Successful supplementation projects are increasing the numbers of returning summer chum adults to two streams, and are providing eggs for reintroducing summer chum to two other streams. There have also been meaningful changes in the production of hatchery fish in the region, designed to reduce negative interactions with summer chum juveniles. The combined effects of these changes have contributed to some higher summer chum escapements in recent years. However, additional measures, particularly with respect to habitat protection and restoration, are required for successful recovery of summer chum salmon.

Puget Sound Bull Trout (South Fork Skokomish stock (WDFW 1998)):

There is little or no information on adult age class structure, sex ratio, juvenile life history strategy or smolt emigration timing. Hood Canal Ranger District (Olympic National Forest) staff recently conducted a radio-tagging study of (presumed) bull trout in the South Fork Skokomish River (Ogg and Taiber 1999). The objectives of the study were to examine seasonal migration patterns and to identify spawning grounds and spawning times. In addition, Forest Service staff has been conducting trapping, snorkeling and electrofishing surveys for bull trout in the South Fork. They believe that fluvial and resident life history forms are present. There is no evidence from their work of an anadromous life history form, though anadromous fish may be present. Sexually mature fluvial fish range from 38 to 59 cm. During the course of the telemetry study, spawning migration activity in fluvial fish began in late October when the water temperature dropped below 7°C and river flow increased. Spawning time appears to be from late October through late November. Spawning grounds have tentatively been identified in the mainstem South Fork from RM 18 through RM 23.5 and in Church, LeBar and Brown Creeks. Juvenile rearing areas include, but should not be considered restricted to, RM 19 through RM 23.5.

In general, chinook are not seen above the Gorge of the South Fork beginning at RM 7 (C. Baranski, WDFW, personal communication, March, 2000) so interactions between hatchery chinook and bull trout are not expected unless fluvial or anadromous fish, if any, move downstream into the lower South Fork or the mainstem Skokomish River.

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

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

As per the Co-managers (Puget Sound) Technical Review Team (PSTRT), the preliminary critical and viable population thresholds for the mid-Hood Canal chinook have been determined to be at 400 and 750, respectively (PSTRT 2003). Also, critical and viable population thresholds for Skokomish chinook have been determined by the PSTRT to be at 1,300 and 3,650, respectively. The SaSI document (Draft, WDFW 2002) defines the status of mid-Hood Canal chinook as *critical* and the Skokomish River chinook as *depressed*.

Hood Canal summer chum ESU (Source: Summer Chum Salmon Conservation Initiative):

1. Union River SC are *healthy*
2. Lilliwaup and Jimmycomelately Creeks SC are *critical*
3. Hamma Hamma, Duckabush, Dosewallips, Big/Little Quilcene, and Snow Creek SC are *depressed*

Puget Sound bull trout in Hood Canal are *viable.*

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

The program began with brood year (BY) 1995 and has produced chinook adults that contributed to total escapements of 172, 557, 381, 248, 32, 95 and 49 naturally spawning chinook in 1998, 1999, 2000, 2001, 2002, 2003 and 2004, respectively. Total smolt to adult survival data is unavailable (fishery impact on these fish is unknown). Smolt to escapement survival rates were about 0.4% to 1% for BY 1995 through BY 1998 and about 0.1% to 0.2% for BY 1998 through BY2000 Recent escapements and survival rates are a concern and a technical workgroup, including NOAA Fisheries, will be convened to evaluate, discuss, and decide on modifications for the program.

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.

Table 2. 1988-2003 spawner abundance data for Hood Canal fall Chinook, Hood Canal summer chum and Lake Cushman bull trout/Dolly Varden. Chinook data are from WDFW Chinook run reconstruction through 2002 and WDFW files (T. Johnson, personal communication). Summer chum data are from WDFW and PNPTT (2003) through 2002 and J. Ames (WDFW, letter to NOAA Fisheries dated December 24, 2003). Bull trout data are from WDFW (1998) through 1996 and from D. Collins (WDFW, personal communication) thereafter.

Year	Fall Chinook	Summer Chinook	Bull Trout/Dolly Varden
1988	2,772	2,967	152
1989	1,425	598	174
1990	724	429	299
1991	1,858	747	299
1992	940	2,377	285
1993	1,172	756	412
1994	1,072	2,492	281
1995	1,999	9,462	250
1996	1,028	20,490	292
1997	492	8,972	No data collected
1998	1,803	4,001	119[1]
1999	3,020	4,114	90[1]
2000	1,690	8,649	93
2001	2,883	12,041	87
2002	1,725	11,454	93
2003	1,512	35,696	

Limitations to these data do exist. For most of the period of record, escapement observations of the Skokomish River have functioned as the basis for escapement estimates of other streams in Hood Canal. For example, the Hamma Hamma escapement in 1991 is based on the proportion of the peak count of live fish in the Hamma Hamma relative to the peak live count in the Skokomish (Smith and Castle 1994). Only in the most recent years, beginning 1993, have the escapements of the Hamma Hamma been based solely on data collected in-river. Furthermore, beginning in 1986, the general methodology for estimating chinook escapements in Hood Canal was modified such that, for a given year, an escapement estimated with the new method would be lower than the estimate made with the previous method. Therefore, escapement estimates before 1986 are not directly comparable to those for the years 1986 and after. Similarly, Hamma Hamma escapements of the most recent period based solely on in-river data and starting 1998, are not directly comparable with escapements of the earlier periods. These limitations notwithstanding, the estimates of spawning abundance shown above may serve at least as indices of escapement over time, remembering that changes of escapement estimation methods were initiated in 1986 and 1998.

-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.

It is unknown whether hatchery-origin chinook returned to the Hamma Hamma watershed from 1967-1997. Beginning with brood year 1995, the otoliths of chinook salmon embryos produced in the restoration program were thermally mass-marked (otolith-marked) prior to the release of fingerlings. Examination of otoliths recovered from spawned adults provides a method to separate the number of restoration (hatchery) fish from the number of naturally spawning (wild) fish. Based on otolith analysis of chinook adults collected on the spawning grounds during 1998, it is estimated that 46% of the age 3 chinook returning to the Hamma Hamma were of hatchery origin (memo from Jeff Grimm, WDFW, to HCSEG, dated May 17, 1999). During 1999, it is estimated that about 77% of age 3 chinook and 97% of age 4 chinook were otolith-marked; overall, 83% of the chinook returning were otolith-marked and of hatchery origin (Thom H. Johnson, WDFW, personal comm., based on Jeff Grimm memo dated May 26, 2000 and age composition data from scales).

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

- 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.

Listed chinook salmon adults will be collected, spawned and released from August through October and result in a take. In the Hamma Hamma, other listed chinook adults would be handled and passed upstream during brood stocking and may lead to injury to listed fish through delayed migration and spawning, or delayed mortality as a result of injury or increased susceptibility to predation.

Incubation and rearing of chinook from September through April has a high potential to take listed chinook due to natural mortality causes and due to fish culture activities and conditions which affect fish health and development including handling procedures, fertilization procedures, water temperature, water quality, water flow, feeding success, and transport and/or transition from fresh to saltwater environments. Risk aversion measures minimize the likelihood for the take of listed chinook (see 5.8). No take of other listed salmonids due to these activities is anticipated.

Physical harm of reared chinook at release (March through May) due to de-scaling or increased susceptibility to predation at release has a potential to take listed chinook, but protocols will be observed to minimize take. No take of other listed salmonids is anticipated.

The contact with chinook during spawner escapement surveys (August through October), carcass recovery programs (September and October), and other monitoring and evaluation programs has a potential to take listed chinook, but care is taken not to harm, harass or otherwise disturb chinook spawners.

Summer Chum: The SCSCI provides an assessment of risks to summer chum juveniles and adults posed by the production of Hamma Hamma fall chinook, summer chum risk averse measures to implement, and monitoring and evaluation measures to be applied to minimize any risks.

Fall Chinook: The risks and benefits posed by hatchery-origin juvenile chinook to wild juvenile chinook will depend on the number, size, release time and stream residence time of the hatchery fish. Hamma Hamma program releases approximately 75,000 fingerlings annually and production will be managed to minimize potential adverse effects to listed fall chinook.

Predation and Competition: Hamma Hamma chinook smolts are released at a size of about 80 to 100 mm in May when wild smolts are expected to be about 60 to 80 mm long (D. Seiler, WDFW, personal communications, February, 2000). The USFWS (1994) has suggested that juvenile salmonids can consume fish which are one-third or less their own body length. Given this rule of thumb and approximate sizes of hatchery and wild fish at the time chinook are released, predation by hatchery smolts is not expected to be a significant problem. The restoration program will result in an increase in the number of chinook salmon carcasses in freshwater areas and provide a source of nutrients that will benefit other salmonids and non-salmonids.

The Species Interaction Working Group (SIWG) (1984) categorized various risks to wild salmon species and steelhead from hatchery-origin salmon species and steelhead. Their assessment of risks to wild chinook from hatchery chinook is summarized below.

Table 3. Risks posed by hatchery-origin chinook to wild chinook. Data from SIWG (1984).

Type of Risk	Level of Risk
Freshwater predation	Unknown
Freshwater competition	High potential
Early marine predation	Unknown
Early marine competition	High potential

The high risk of competition assumes significant temporal and spatial overlap between hatchery and wild juvenile chinook and increases when numbers of hatchery fish released are far larger than numbers of wild fish (SIWG 1984). We have no information on hatchery-wild overlaps in the Skokomish basin or in the waters of Hood Canal. Clearly the number of juvenile hatchery chinook greatly exceeds the estimated number of wild juveniles in the Skokomish basin and throughout Hood Canal that may increase the risk of competition or attraction of fish and avian predators.

Releases of hatchery chinook may confer some benefits to wild chinook. If hatchery and wild chinook juveniles occupy the lower Skokomish and the same areas of Hood Canal at the same time, the large excess of hatchery fish may provide wild chinook with some protection from fish and avian predators.

Behavior modification: If large numbers of hatchery chinook are released into watersheds containing younger and/or smaller wild juveniles, they can stimulate premature out-migration in wild fish via a Pied Piper effect (Hillman and Mullan, 1989). Premature out-migration can reduce survival of wild fish because they would be smaller than normal size, making them more vulnerable to predation, and they may not have completed the physiological changes required to adapt to life in salt water. We do not know if this is a concern in the Hamma Hamma basin.

Disease Transmission: It is possible that hatchery fish infected by transmissible pathogens or effluent from hatcheries with sick fish could infect wild fish. Hatchery effluent is not tested for pathogens, so we do not know if the Hamma Hamma site is releasing pathogens into the environment. However, disease transmission from hatchery to wild fish does not appear to occur routinely, possibly because pathogen spread does not occur as readily in less crowded wild fish as in hatchery fish (Tynan 1999).

Bull Trout: We have no information on interactions between Hamma Hamma chinook and wild bull trout in the Skokomish (the only watershed in the Hood Canal currently known to have native char). The risk of competition between hatchery chinook juveniles and bull trout is unknown. Presumably competition can occur where wild and hatchery fish overlap, and space or food are limiting.

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

None

-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).

For listed chinook salmon, projected annual take levels are may be as high as (1) approximately 12,000 eggs and fry mortality during incubation, rearing, and release (based on 10% mortality from green egg to release as fed fry). (2) Approximately 40 pairs of Hamma Hamma River adults and/or George Adams Hatchery chinook adults collected for broodstock spawning; (3) unintentional lethal take of 2 adults during collection, holding prior to spawning (based on 2% loss of 80 adults collected); (4) 18 adults affected by trapping operation where fish are captured, handled and released upstream (based on 100 adults collected minus broodstock and unintentional lethal take); (5) 200 adults affected by contact with listed fish during spawner surveys and carcass and mark recovery projects (based on multiple events and average of 1 occurrence/spawner for one-third of 600

spawners); and (6) 200 carcasses sampled for otoliths, scales, genetic stock identification, and other biological information during spawner surveys, brood stocking, and routine monitoring and evaluation activities (based on target sample size of 200).
See “Take Table” in back.

Hatchery activities that may lead to the take of listed summer chum salmon are described in a separate HGMP for the Hamma Hamma summer chum restoration 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.

The take of chinook will be limited since the number of broodstock collected will be consistent with guidelines and protocols based on those developed in the SCSCI and the number of carcasses collected will be consistent with monitoring and evaluation objectives provided by the co-managers. Methods to prevent catastrophic loss of chinook during incubation, rearing, and release are in compliance with program operations and protocols in the SCSCI (which includes measures to cull surplus production) and will limit take.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

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

The Hamma Hamma fall Chinook program is conducted in a manner consistent with the Hood Canal Summer Chum Salmon Conservation Initiative (SCSCI) (WDFW and PNPTT, 2000). Specifically, chinook are not released until after April 1 in order to reduce potential interactions with listed Hood Canal summer chum. There are summer chum in the Hamma Hamma River and they are expected to migrate to salt water in February and March and then to swim seaward quickly (Tynan, 1992). They are expected to clear the area well before the release of Hamma Hamma fingerling chinook in May. WDFW considers that both juveniles and returning adults from the on-station program pose low risk for competition or predation to summer chum (Tynan, 1999; WDFW and PNPTT, 2000).

As affirmed in the co-managers' Resource Management Plan (RMP), the Hamma Hamma fall chinook program must adhere to a number of guidelines, policies and permit requirements in order to operate. These constraints are designed to limit adverse effects on cultured fish, wild fish and the environment that might result from hatchery practices. Following is a list of guidelines, policies and permit requirements that govern WDFW hatchery operations:

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

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

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

Stock Transfer Guidelines. This document provides guidance in determining allowable stocks for release for each hatchery. It is designed to foster development of locally adapted broodstock and to minimize changes in stock characteristics brought on by transfer of non-local salmonids (WDFW 1991).

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

National pollutant Discharge Elimination System Permit Requirements This permit sets forth allowable discharge criteria for hatchery effluent and defines acceptable practices for hatchery operations to ensure that the quality of receiving waters and ecosystems associated with those waters are not impaired.

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

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

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

This HGMP is consistent with relevant standing orders and agreements. The Puget Sound Salmon Management Plan (PSSMP) (1985) and the Hood Canal Salmon Management Plan (HCSMP) are federal court orders that currently control both the harvest management rules and production schedules for salmon in Hood Canal under the *U.S. v. Washington* management framework. The parties recognize that it may be necessary to modify these plans in order to implement appropriate modifications over time. However, the provisions of the PSSMP and HCSMP will remain in effect until modified through court order or by mutual agreement. This program operates within the overview of a technical workgroup comprised of representatives of NMFS, WDFW, USFWS, Point-no-Point Treaty Tribes, HCSEG, and LLTK

3.3) Relationship to harvest objectives.

Tribal and non-Indian commercial and recreational fisheries directed at fall chinook and other species produced through hatchery releases will be managed to minimize incidental effects to listed chinook salmon and summer chum salmon. Time and area, gear-type restrictions, and chinook and summer chum release requirements will be applied to reduce takes of listed salmon in the Hood Canal mainstem, extreme terminal marine area, and river areas where these fisheries directed at other hatchery species occur. Compliance with the fisheries management strategy defined in the SCSCI will lead to fisheries on WDFW hatchery-origin stocks that are not likely to adversely affect listed chinook or listed summer chum.

Each year, state, federal and tribal fishery managers plan the Northwest's recreational and commercial salmon fisheries. This pre-season planning process is generally known as the North of Falcon process, which involves a series of public meetings between federal, state, tribal and industry representatives and other concerned citizens. The North of Falcon planning process coincides with meetings of the Pacific Fishery Management Council, which sets the ocean salmon seasons at these meetings.

For the 2001-02 and 2002-03 seasons, the co-manager's prepared a Harvest Management Plan for Puget Sound Chinook Salmon. The Plan states specific objectives for harvest of the 15 Puget Sound management units, the technical bases for these objectives, and procedures for their implementation. The Plan assures that the survival and recovery of the Puget Sound ESU will not be impeded by fisheries-related mortality.

The Co-managers have recently prepared a harvest management plan (HMP) describing harvest management guidelines for the Chinook of Puget Sound, including Hood Canal (PSIT and WDFW 2004). This document has been prepared in response to the listing of Puget Sound Chinook as a threatened species and the associated requirement that such a plan be prepared as part of the process to qualify harvest as a permitted activity under section 4(d) of the Endangered Species Act. The harvest management guidelines of the HMP apply to planning annual harvest regimes for the 2005 – 2009 management years. The Co-managers' rationale behind and process for annual planning of the Chinook fisheries are described in the document. Specific approaches are described for each Chinook management unit within Puget Sound, including the two management units (mid Hood Canal and Skokomish) in Hood Canal. The overall objective of the HMP is to: *Ensure that fishery-related mortality will not impede rebuilding of natural Puget Sound Chinook populations, to levels that will sustain fisheries, enable ecological functions, and are consistent with treaty-reserved fishing rights.*

The intent of the HMP is to constrain harvest to the extent necessary to enable rebuilding of natural Chinook populations in the Puget Sound ESU, provided that habitat capacity and productivity are protected and restored. It includes explicit measures to conserve and rebuild abundance, and preserve diversity among all the populations that make up the ESU. The

ultimate goal of the HMP, and of concurrent efforts to protect and restore properly functioning Chinook habitat, is to rebuild natural productivity so that natural Chinook populations will be sufficiently abundant and resilient to perform their natural ecological function in freshwater and marine systems, provide related cultural values to society, and sustain commercial, recreational, ceremonial, and subsistence harvest.

The Plan for the 2005-2009 seasons was submitted and NOAA Fisheries reached a finding, based on the conditions stated in the 4(d) rule, that fisheries-related take in Washington waters is exempt from prohibition under Section 9 of the ESA.

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.

For the Skokomish and Mid-Hood Canal management units (MU), during the recovery period, pre-terminal fisheries in southern U.S. areas (SUS) will be managed to ensure a pre-terminal exploitation of 15% or less, as estimated by the FRAM model. If the recruit abundance is insufficient for each MU's goal to be met, additional terminal fishery management measures will be considered.

The NOAA Fisheries Section 7 consultation on the 2000-01 through 2003-04 PFMC, Fraser Panel and Puget Sound marine and freshwater fisheries resulted in approval of the fisheries proposed in the Puget Sound Chinook Harvest Management Plan. The Plan for the 2005-2009 seasons was submitted and NOAA Fisheries reached a finding, based on the conditions stated in the 4(d) rule, that fisheries-related take in Washington waters is exempt from prohibition under Section 9 of the ESA.

3.4) Relationship to habitat protection and recovery strategies.

The chinook restoration program is integrated with habitat restoration and management measures as defined in the SCSCI since chinook and summer chum utilize the same areas of this river. The SCSCI provides a standardized approach to determine freshwater and estuarine limiting factors in each summer chum watershed. Habitat factors for decline and recovery for each watershed are described. In addition, at the ESU scale, protection and restoration strategies for each limiting factor for decline are provided. The goal of the habitat protections and restoration strategy is to maintain and recover the full array of watershed and estuarine-nearshore processes critical to the survival of summer chum across all life stages.

Hood Canal Chinook: Limiting factors analyses have not been completed specifically for Hood Canal natural chinook stocks and factors for decline and recovery are not currently available. Limiting factors analyses have recently been completed for streams and nearshore areas in WRIA 16 (Skokomish, Dosewallips, Duckabush and Hamma Hamma rivers) and WRIA 17 by the Washington State Conservation Commission (2002-03); these reports provide information useful for identifying factors limiting chinook populations in Hood Canal. In addition, since listed chinook and listed summer chum utilize similar habitats, habitat protection and recovery strategies designed to recover summer chum (see below) will

also aid in the recovery of listed Hood Canal chinook. The principle chinook streams in Hood Canal, the Skokomish, Hamma Hamma, Duckabush, and Dosewallips rivers, are on the westside of Hood Canal. They provide spawning and rearing habitat only in the lower river sections with relatively low gradients. Gradients rapidly become steep with impassable waterfalls, so most of these rivers are not accessible to chinook. All of these rivers, especially the Skokomish, have suffered damage from human activities (dam, roads, logging, diking, agriculture and development) that have exacerbated natural summer low flows, winter flooding and streambed scouring, and sediment deposition due to unstable soils and slopes. Large woody debris is lacking in most areas used by chinook as a result of forest practices. In the Skokomish, the Cushman hydropower project on the North Fork has reduced stream flows in the Skokomish by about 40% and has altered the normal pattern of sediment delivery to the estuary with the result that eelgrass has been lost (WDFW and WWTIT, 1994).

Summer chum: Summer chum supplementation, habitat restoration and harvest management measures are integrated as presented in the Summer Chum Salmon Conservation Initiative (WDFW and PNPTT, 2000). The SCSCI provides a standardized approach to determine freshwater and estuarine limiting factors in each summer chum watershed. Habitat factors for decline and recovery for each watershed are described. In addition, at the summer chum ESU scale, protection and restoration strategies for each limiting factor for decline are provided. The goal of the habitat protections and restoration strategy is to maintain and recover the full array of watershed and estuarine-nearshore processes critical to the survival of summer chum across all life stages. Hood Canal summer chum in westside Hood Canal streams (Lilliwaup Cr., Hamma Hamma, Duckabush, Dosewallips, Big Quilcene and Little Quilcene) are affected by much the same habitat conditions as Hood Canal chinook, especially by habitat perturbations such as diking, streambed instability/gravel aggradations in the lower stream reaches. On the eastside, Hood Canal summer chum streams such as the Union River and Big Beef Creek are low elevation, low gradient streams which are being heavily impacted by rapid development on the Kitsap Peninsula. Logging and associated road constructions have historically created conditions that increased sediment delivery to streams and reduced the supply of large woody debris to streams.

Bull trout: Bull trout in the Hood Canal region are found in the South Fork Skokomish, Lake Cushman and the upper North Fork Skokomish above Staircase Falls. The condition of the South Fork is poor, as mentioned above. Lake Cushman is now a reservoir, and the water level in the one-half mile of the North Fork Skokomish just above the reservoir fluctuates too much to provide stable spawning habitat. Further, the upper and lower Cushman dams have eliminated the anadromous life history form from the North Fork. However, most of the North Fork above Lake Cushman is in the Olympic National Park, and the habitat is essentially pristine.

Other Habitat Protection Efforts and Probable Benefits:

Habitat protection efforts include the Northwest Forest Plan, adopted by the Forest Service and the Bureau of Land Management in the Northwest in 1994. The plan requires increased stream buffers to protect stream habitat for salmonids and limits road construction and some forms of logging on steep/unstable slopes. Most of the Olympic National Forest is in Late Successional Reserves that limits logging to thinning in stands under 80 years old and severely limits or prohibits logging in older stands. The Forest Service is updating road inventories and embarking on a long-term program to improve or close some of the roads that pose the greatest threats to slope stability and streams. The Washington State Legislature in 1999 accepted the Forests and Fish Report that was prepared by USFWS, NOAA Fisheries, EPA, Office of the Governor of the State of Washington, WA DNR, WDFW, WA DOE, the Colville Tribes, Washington counties, and timber industry groups. The emergency forest practices rules, which were developed from the Report, will result in some improvements in state and private forest land management including increased stream buffers and some reduction in logging in riparian areas and unstable upslope areas. Both the federal and state and private forest plans will result in habitat improvements, but are far from ideal for fish. The resulting improvements in fish habitat, such as increased large woody debris in streams, may not be realized for decades given the very poor current conditions of many fish-bearing streams and their riparian areas.

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

Shared Strategy

The Shared Strategy is based on the conviction that:
1) People in Puget Sound have the creativity, knowledge, and motivation to find lasting solutions to complex ecological, economic, and cultural challenges;
2) Watershed groups that represent diverse communities are essential to the success of salmon recovery;
3) Effective stewardship occurs only when all levels of government coordinate their efforts;
4) The health and vitality of Puget Sound depends on timely planning for ecosystem health and strong local and regional economies; and
5) The health of salmon are an indicator of the health of our region salmon recovery will benefit both human and natural communities.

The 5-Step Shared Strategy

1) Identify what should be in a recovery plan and assess how current efforts can support the plan.
2) Set recovery targets and ranges for each watershed.
3) Identify actions needed at the watershed level to meet targets.
4) Determine if identified actions add up to recovery. If not, identify needed adjustments.
5) Finalize the plan and actions and commitment necessary for successful implementation.

The Co-managers have submitted a recovery-planning chapter for mid Hood Canal Chinook to Shared Strategy for inclusion in the recovery plan for the Puget Sound Chinook ESU.

Salmon Recovery Funding Board

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

Lead Entities

Lead entities are voluntary organizations under contract with the Washington State Department of Fish and Wildlife (WDFW). Lead entities define their geographic scope and are encouraged to largely match watershed boundaries. Lead entities are essential in ensuring the best projects are proposed to the Board for funding in its annual grant process.

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

The Lead Entity for the Hood Canal basin is the Hood Canal Coordinating Council. It oversees an area that is 62 miles long (Hood Canal) and covering about 358 miles of shoreline. Land ownership in the watershed is 48% federal and includes portions of Olympic National Park and Olympic National Forest, 39% private, 12% state and local, and 1% Tribal trust lands. Major projects are underway to restore critical estuarine habitat. These include removal of levees, ditches and tidegates to allow disconnected and degraded salt marshes to recover in the Skokomish, Union and Dosewallips estuaries. Natural functions and processes are being restored in the Chimacum Creek estuary through removal of fill and riprap. The Restoration and protection of Hood Canal Chinook and summer chum freshwater and nearshore habitats are in the highest priority category of HCCC ‘s salmon habitat recovery strategy.

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

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

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 Hamma Hamma River watershed to the detriment of population abundance and the program's success in restoration. Species that may negatively impact program fish through predation may include:

- Orcas
- Sea lions
- Harbor seals
- River otters

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

- Summer chum (listed)
- Chinook (listed)
- Bull trout (listed)

(*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 Hamma Hamma River watershed through natural and hatchery production. Juvenile fish of these species may serve as prey items for the chinook during their downstream migration in freshwater and into the marine area. Decaying carcasses of spawned adult fish may contribute nutrients that increase productivity in the watershed, providing food resources for the emigrating chinook.

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

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

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

SECTION 4. WATER SOURCE

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

Johns Creek: The water source at Johns Creek is several groundwater springs. The water is specific pathogen-free, the water quality is consistent in temperature and amount with year around temperature ranging from 46 - 50 degrees and available flow of approximately 1 cubic foot per second (cfs).

George Adams Hatchery: Water for the George Adams Hatchery is supplied from Purdy Creek, three wells and Ellis Spring. Well water is currently used for incubation and also for rearing any fish that require pathogen-free water. This generally means fish, which are transferred to George Adams for short-term rearing, can be then transferred out of the Fish Health Management Zone. George Adams fall chinook are reared on Purdy Creek water which should minimize straying into other watersheds.

The water right for Purdy Creek is 21.3 cubic feet/second (cfs). Flow in Purdy Creek has diminished in recent years because of drought conditions and development in the watershed. Because of its proximity to Highway 101, Purdy Creek is at risk from contamination from spills on the highway. One such spill of zinc occurred several years ago. The water right for Ellis Spring is 2.5 cfs. Flow is variable from a low of 1.0 cfs to 2.5 cfs. The water right for George Adams wells is 6.4 cfs. The wells are used only for incubation or in instances when pathogen-free water is required. Otherwise, they are not used in order to allow the aquifer to recharge.

LLTK Lilliwaup Hatchery: The Lilliwaup facility water originates from Beardslee Creek- a fish free, spring-fed tributary to Lilliwaup Creek. The creek flows on the surface for approximately 500 yards to a self-cleaning gravity intake. Beardslee Creek water temperature is relatively consistent throughout the year, ranging from 44-50 degrees and has an available flow of about 3 cubic feet per second (cfs).

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.

John Creek: There is no chance of natural fish being affected by the hatchery water withdrawal because the water sources are fish-free. The intake structures are supplied by infiltration and are adequately screened to minimize risk to any possible listed fish. The Johns Creek facility will produce a relatively small amount of fish each year, and well under the 20,000 pounds per year criteria set by WDOE as the limit for concern regarding hatchery effluent discharge effects and for the requirement for an NPDES permit. This will likely lead to no adverse effects on water quality from the program on listed fish. In addition, there are multiple small springs that supply the incubators and the pond. The loss of any one of these spring supplies would not jeopardize the entire program.

George Adams Hatchery: Intake screens conform to minimize the risk that wild juvenile salmonids could enter the fresh water intake. There are no wild chinook or chum above the Purdy Creek intake. There is no formal pollution abatement pond at George Adams. Hatchery effluent is discharged into an adjacent wetland at George Adams and does not violate the conditions of the NPDES permit (permit # WAG13-1019). The Production Division has proposed installation of a clarifier to treat effluent before routing it to the wetland, if funding becomes available.

The water right permit # for Purdy Creek, Ellis Spring and the wells (at George Adams) is S2-20811 (for further water right information contact the Department of Ecology).

SECTION 5. FACILITIES

The program will be consistent (1) with the understandings presented in letters from LLTK and HCSEG (dated September 26,2001), NMFS (dated October 19, 1999 and November 16, 2000), WDFW (dated September 18, 2000), and the broodstock benefit/risk analysis and recommendations developed by NMFS, WDFW and PNPTC (dated September 15, 2000); and (2) with updated understandings of the program technical workgroup, including NOAA Fisheries.

5.1) Broodstock collection facilities (or methods).

Hamma Hamma River: Broodstock are collected by using a hook-&-line method and a block seine method or other methods determined by the Co-Managers (see Attachment 1). To assure that broodstock collected are representative of the entire run, a capture schedule will be developed by the Co-Managers with weekly target goals. Adult chinook will be collected randomly according to the schedule and will be placed in PVC fish tubes in the river until ready for spawning. Fish are spawned directly adjacent to the Hamma Hamma River. Spawning is accomplished as needed beneath a temporary awning to protect the eggs and milt collected from the fish from rain.

George Adams Hatchery: Adult broodstock collection occurs in a 71' X 157' X 27" trap/holding pond located in Purdy Creek. The trap begins operation August 1 for chinook and remains open through the end of the chum run in early December.

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

Milt and eggs from Hamma Hamma broodstock will be transported chilled in containers by truck from the Hamma Hamma River collection sites to the Johns Creek incubation and rearing facility for fertilization and incubation.

George Adams Hatchery: It is not typically necessary to transport adult broodstock on site, however, they are transported in a 400-gallon planting tank with supplemental oxygen and recirculation motors when necessary.

5.3) Broodstock holding and spawning facilities.

At the Hamma Hamma, green broodstock will be held in PVC fish tubes in the river that will be secured to prevent predation or poaching. All methods employed will be consistent with the guidelines provided by the Co-Managers. At George Adams Hatchery, adult broodstock are held in the trap/holding pond until they are spawned. Spawning facilities are located adjacent to the trap/holding pond.

5.4) Incubation facilities.

Remote Site Incubators (RSIs) and Vertical Stack Incubators are used at Johns Creek and LLTK Lilliwaup Hatchery.

George Adams Hatchery: Chinook eggs are incubated to eyed-egg stage in Simms deep troughs which are each loaded with 450 pounds of eggs (approximately 900,000 chinook eggs). Egg density in the deep troughs is 19 pounds per cubic foot (lbs/cu.ft). After eyeing, eggs are transferred to vertical stack incubators for hatching. Egg density at hatching is 5.5 pounds per tray (approximately 9,900 chinook eggs).

5.5) Rearing facilities.

Johns Creek: Earthen ponds or 16’ x 3’ x 3’ fiberglass raceways at

George Adams Hatchery: After hatching, chinook eggs are moved from the incubators into 3- 20' X 77' X 31" raceways for initial rearing. 2.4 million fish are then transferred from the raceways to a 61' X 167' X 55" gravel-bottomed rearing/release pond (Pond 9) with a maximum density of 1.26 lbs/cu.ft. at release and 1.4 million fish are transferred from the raceways to a 48' X 240' X 33" gravel-bottomed rearing/release pond (Pond 7) with a maximum density of 1.29 lbs/cu.ft at release.

LLTK Lilliwaup Hatchery: Emergent fry release into 4’ circular tanks inside the Lilliwaup hatchery building. Feed is begun inside, then the fish are transferred to 20’ circular tanks located outside.

5.6) Acclimation/release facilities.

Fiberglass raceways and earthen rearing ponds at Johns Creek. At George Adams Hatchery, as they grow, chinook juveniles are split into two gravel-bottomed rearing/release ponds with a maximum density of 1.29 lbs/cu.ft. at release.

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

Remote sites have failed in the past during catastrophic flooding events and broken equipment (e.g., pipes). Full time staff will check the sites daily and be on-site during inclement weather. As well, routine maintenance will prevent equipment failures. Severe flooding at George Adams Hatchery in 1997 led to the early release of 1,949,600 chinook fry. Some of these died, but the number is not known.

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 facility at John Creek is supplied by water that is gravity-fed from an adjacent pond. Incubators and starter raceways are each fed by independent springs and therefore will not be affected by power failures. Family groups of eggs are split up into three or more groups, each on a separate spring supply in order to provide redundancy in the water supply and spread the risk. Full time staff will check the sites daily and be on-site during inclement weather. The fish for this program are from adults who have been screened for reportable pathogens, and the resulting fry will be monitored for evidence of fish health problems.

George Adams Hatchery is staffed full time with resident professional staff. The hatchery is equipped with alarm systems and backup generator to provide auxiliary power in the event of a power failure. There are provisions at George Adams Hatchery for switching to alternate water sources in the event of the loss of one water source.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY 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.

The program will be consistent (1) with the understandings presented in letters from LLTK and HCSEG (dated September 26,2001), NMFS (dated October 19, 1999 and November 16, 2000), WDFW (dated September 18, 2000), and the broodstock benefit/risk analysis and recommendations developed by NMFS, WDFW and PNPTC (dated September 15, 2000); and (2) with updated understandings of the program technical workgroup, including NOAA Fisheries..

6.1) Source.

Chinook adults returning naturally to the Hamma Hamma River and/or to George Adams Hatchery will be the source of the program broodstock.

6.2) Supporting information.

6.2.1) History.

The founding hatchery source for this program has been eyed eggs from George Adams Hatchery. The George Adams Chinook stock is founded largely from Green River Chinook stock via the Hoodsport Hatchery, Tumwater Falls Hatchery and Soos Creek Hatchery. From 1995-2003, George Adams Hatchery stock has been used and included as broodstock for this restoration project. Genetic characterization of Hamma Hamma River chinook, to date, suggest that returns to the Hamma Hamma River are not genetically distinct from recent George Adams and Hoodsport hatchery broodstock (A. Marshall, WDFW, unpublished data). Available genetic and tagging information indicates that the existing Hamma Hamma natural population is derived from the introduced hatchery stocks and do not represent the historically present local population. NOAA Fisheries determined that George Adams Hatchery and Hamma Hamma hatchery chinook are included and listed as part of the Puget Sound Chinook ESU.

6.2.2) Annual size.

Collect approximately 40 pairs from Chinook naturally returning to the Hamma Hamma River and/or to George Adams Hatchery.

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

See 6.1 and 6.2.2.

6.2.4) Genetic or ecological differences.

Available genetic and tagging information indicates that the existing Hamma Hamma natural population is derived from the introduced hatchery stocks and do not represent the historically present local population. NOAA Fisheries determined that George Adams Hatchery and Hamma Hamma hatchery chinook are included and listed as part of the Puget Sound Chinook ESU.

6.2.5) Reasons for choosing.

See 6.2.4. In addition, the intent is to boost and then foster the chinook population currently adapted and adapting to the Hamma Hamma River.

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

Available genetic and tagging information indicates that the existing Hamma Hamma natural population is derived from the introduced hatchery stocks. The risk of among population genetic diversity loss will be reduced by randomly selecting naturally returning chinook salmon and George Adams Hatchery chinook for use as broodstock in the restoration program. The broodstock are collected randomly in a manner representative of the timing and magnitude of the return to the Hamma Hamma River and George Adams Hatchery.

SECTION 7. BROODSTOCK COLLECTION

The program will be consistent (1) with the understandings presented in letters from: LLTK and HCSEG (dated September 26,2001), NMFS (dated October 19, 1999 and November 16, 2000), WDFW (dated September 18, 2000), and the broodstock benefit/risk analysis and recommendations developed by NMFS, WDFW and PNPTC (dated September 15, 2000); and (2) with updated understandings of the program technical workgroup, including NOAA Fisheries.

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

Chinook adults.

7.2) Collection or sampling design.

Pairs of Hamma Hamma chinook used for broodstock will represent the naturally spawning donor population with respect to run timing, size, age, and any other traits identified as important for long-term fitness. Collection of pairs will be based on the average weekly run timing developed by WDFW from brood years 1998 and 1999 during the period from August 27 through November 24. In practice, to provide flexibility and to allow for early/late run timing, the number of pairs collected will represent the normal timing and run distribution during each of three two-week periods: from September 10-23, from September 24-October 7, and from October 8-21. Fish will be collected and held in PVC tubes in the Hamma Hamma River until ripe and spawned. Fish not retained for broodstock will be released unharmed into the river to spawn naturally.

At George Adams Hatchery, ripe pairs will be selected to coincide with the collection and spawn timing of ripe Hamma Hamma fish. To broaden the genetic base of the egg takes, partial lots of green eggs (i.e. 1,300 to 2,500 eggs per female) from two or more females will be combined and then used as “one” female in the factorial crosses (see Section 8 and Attachment 3).

7.3) Identity

Marking of hatchery fry and recovery of otoliths from adults will allow identification of hatchery and natural-origin fish. In addition, beginning with brood year 1999, all hatchery fish released were marked with an adipose-clip and subsequent returning hatchery adults can be identified.

7.4) Proposed number to be collected

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

In addition, eggs will be collected from fish at George Adams Hatchery during the same time frame and manner described in 7.2. Eggs collected at George Adams will be collected in approximately 15,000, 30,000 and 15,000 egg lots per each two week intervals: September 10-23, September 24-October 7, and October 8-21 Green eggs from two or more females will be combined and then used as a one female aliquot in the factorial crosses (see Section 8 and Attachment 3).

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-03), or for most recent years available:

Broodstock targets have been met most years.

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

The production of surplus eggs or fish is avoided to the extent feasible by limiting the number of adult chinook secured through broodstock collection operations. Any surplus production will be treated in accordance with protocols provided by the co-managers.

7.6 Fish transportation and holding methods.

Adults collected for broodstock in the Hamma Hamma River will be held in PVC fish tubes in the river that will be secured to prevent predation or poaching. All methods employed will be consistent with the guidelines provided by the Co-Managers. Eggs and milt will be transported chilled in containers by truck from the Hamma Hamma River collection sites to the Johns Creek incubation and rearing facility. If necessary, fed fry will be transported, by truck, to the release site on the Hamma Hamma River. Eyed eggs and/or fry collected from broodstock at George Adams Hatchery will be transported for rearing, acclimation, and release at Johns Creek sites.

7.7) Describe fish health maintenance and sanitation procedures applied.

Green eggs collected from the Hamma Hamma River will be incubated at the Johns Creek site, on the Hamma Hamma until they are certified virus free. At that time they will be moved to the Lilliwaup site for otolith marking, as eyed eggs, for otolith marking.

At all sites, fish health monitoring associated with adult fish used in the program is conducted through the WDFW Fish Health Division. The incidence of viral pathogens in chinook broodstock will be determined by sampling fish at spawning in accordance with procedures set forth in the Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State (NWIFC and WDFW, 1998). Ovarian fluid, kidney, and spleen samples are collected from all fish spawned for evaluation by WDFW Fish Health Division staff for disease certification purposes. Sanitation measures will be in accordance with WDFW Fish Health recommendations.

7.8) Disposition of carcasses.

Length data, weight data, scales, DNA and/or allozyme tissue samples, and otoliths will be collected from all broodstock carcasses from fish collected at the Hamma Hamma River, disposition will be back into the stream for nutrient supplementation.

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

The risk of fish disease amplification will be minimized by following Co-manager Disease Control Policy sanitation and fish health maintenance and monitoring guidelines. The multi-trait distribution of the broodstock closely matches the multi-trait distribution of the target population (similar spawn timing, size, appearance, age structure, etc.).

SECTION 8. MATING

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

The program will be consistent (1) with the understandings presented in letters from: LLTK and HCSEG (dated September 26,2001), NMFS (dated October 19, 1999 and November 16, 2000), WDFW (dated September 18, 2000), and the broodstock benefit/risk analysis and recommendations developed by NMFS, WDFW and PNPTC (dated September 15, 2000). See end of document; and (2) with updated understandings of the program technical workgroup, including NOAA Fisheries.

8.1) Selection method.

Fall chinook are collected at random from the Hamma Hamma River by the hook-&-line method or the block seine method, or as advised by the Co-Managers, on a weekly basis. The collection schedule is determined by the Co-Managers, proportional to the timing, weekly abundance and duration of the total return to the river (see 7.2). At George Adams Hatchery, ripe pairs will be selected to coincide with the collection and spawning of ripe Hamma Hamma pairs. See 7.2 above for additional details.

8.2) Males.

Use of backup males is not an integral part of the program, but may occur as a precautionary measure. Jacks will be used proportional to their abundance in the total return to the creek. Milt will not be pooled.

8.3) Fertilization.

Fall chinook eggs collected at the Hamma Hamma will be transported and, chilled, to the Johns Creek incubation site for fertilization and incubation. At the George Adams Hatchery partial lots of green eggs from two or more George Adams Hatchery females will be combined and then used as one female in factorial crosses using at least a 1:1 spawning ratio. Sanitation protocols are done in accordance with the Co-managers Fish Health (Disease Control) Policy.

8.4) Cryopreserved gametes.

None used.

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

One to one (1:1) individual matings or a factorial mating scheme will be applied to reduce the risk of loss of within population genetic diversity for the chinook salmon population that is the subject of this restoration program.

SECTION 9. INCUBATION AND REARING –

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

The program will be consistent (1) with the understandings presented in letters from: LLTK and HCSEG (dated September 26,2001), NMFS (dated October 19, 1999 and November 16, 2000), WDFW (dated September 18, 2000), and the broodstock benefit/risk analysis and recommendations developed by NMFS, WDFW and PNPTC (dated September 15, 2000). See at end of document; and (2) with updated understandings of the program technical workgroup, including NOAA Fisheries.

9.1) Incubation:

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

The following survival rate goals and objectives for each life stage will be applied to all programs; these rates will be used as criteria for measuring the effectiveness of each program.

Life Stage	% Survival by Life Stage	Cum. % Survival from Green Egg
Green egg to eye-up	90.0 %	90.0 %
Eye-up to Swim-up	99.5 %	89.5 %
Swim-up to release	95.0 %	85.0 %

Approximately 120,000 eggs will be collected from George Adams Hatchery fish and/or from chinook returning to the Hamma Hamma River.

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

None anticipated. Any surplus production will be handled consistent with protocols provided by the co-managers.

9.1.3) Loading densities applied during incubation.

Reared at low densities; with less than 25,000 per 55 -gallon remote site incubators.

9.1.4) Incubation conditions.

Spring water - 48 degrees, 12 gallons per minute (gpm) per Remote Site Incubator (RSI) or Vertical Stack Incubator (VSI)

9.1.3) Ponding.

Fish from John's Creek volitionally migrate from the RSI to a fiberglass starter raceway or are ponded from the VSI at swim-up.. At George Adams Hatchery, fish are ponded from VSI at swim-up.

9.1.5) Fish health maintenance and monitoring.

WDFW fish pathologist examines fish prior to release.

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 will be incubated using high quality water to minimize the risk of catastrophic loss due to siltation. Family will be distributed into at least three or more different incubation units, each with a separate spring water supply, to spread the risk and prevent catastrophic loss (see section 5.8). All chinook are incubated under the guidance of fish health personnel from WDFW and in accordance with the Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State (NWIFC and WDFW, 1998); see 9.1.6 above.

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.

Fish survival has ranged from 90-95% for unfed fry to release.

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

Hatchery rearing densities will be those that yield the highest expected survivals. The following conservative "standard" and "maximum" pond loading densities will be applied in all proposed restoration programs to promote the release of healthy, viable fish.

	Pounds fish/gpm inflow		**Pounds fish/ft3 rearing volume**	
Size	Standard	Max.	Standard	Max.
Swim-up	<1.0	1.5	0.5	0.75
1300-600/lb	1.0	2.5	1.0	2.0
600-90/lb	1.5	3.0	1.0	2.0

Actual loading rates at the John Creek facility, LLTK Lilliwaup Hatchery or George Adams Hatchery will be consistent with these guidelines.

9.2.3) Fish rearing conditions

Fish are reared in earthen ponds or 16' x 3' x 3' fiberglass raceways on spring water, with underwater feeding or hand feeding and are protected by bird cover at John Creek, fish are reared in earthen ponds or 16' x 3' x 3' fiberglass raceways on spring water, with underwater feeding or hand feeding and are protected by bird cover. At George Adams the fish are reared in ambient surface water from Purdy Creek. At Lilliwaup Emergent fry release into 4' circular tanks and are held at a maximum density of 2,500 fry per tank. After feed is introduced the fry are moved to outside 20' circular tanks at a density of 25,000 fry per tank.

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.

At John Creek, these fish are not reared in typical hatchery ponds, and are not sampled at the same level of frequency since they are in systems that mimic the natural environment. They are about 1300 fish per pound (fpp) at the start of feeding in January, and are 70 to 90 fpp in May at release.

At George Adams Hatchery fish are weight sampled weekly and feed rates are adjusted to achieve a proper size and time of release.

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

Not available

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

Fish are started on Biodiet starter #3 and then switched to Biodiet grower at 400 fpp. They are fed a maximum of 2% body weight per day. They also utilize the available natural food. Maximum loading is 3 lbs fish /gpm. At George Adams Hatchery, fish are reared in a diet of Bio Oregons' Bio-Diet Starter and BioDiet Grower feed at rates between 1.7 and 2.5% B.W./day.

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

Fish checked routinely by a WDFW fish pathologist as per the Co-managers Fish Health Policy (1998).

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

Gill ATPase activity is not monitored.

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

John Creek: The fish are reared in natural, earthen ponds or 16’ x 3’ x 3’ fiberglass raceways. They are moved into the earthen pond via the starter raceways, as they are adipose clipped. The degree of natural rearing which they will receive is determined by how quickly they can be clipped in the fiberglass raceways. They are clipped from the fiberglass tanks into the earthen ponds. They are fed with a battery operated feeder B with the food presented underwater. They are allowed to emigrate volitionally to the river from the earthen pond starting at a size of about 90 fpp and/or are transported to the Hamma Hamma for release.

George Adams Hatchery: no natural rearing methods are used.

LLTK Lilliwaup Hatchery: All interior tanks are covered to provide shade, and the use of overhead lights inside the hatchery facility is minimized while fry are rearing inside.

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 Johns Creek sites are supplied with water that is gravity-fed from multiple natural springs. Incubating and rearing eggs and fry will therefore not be affected by power failures. Water supplies to the incubators and ponds is redundant and the loss of any one of them will minimize loss. Full time staff at least one time daily will check the facility and staff will be on-site during extreme rain events or extreme cold weather events. Uniform rearing methods will be applied across egg take groups.

SECTION 10. RELEASE

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

The program will be consistent (1) with the understandings presented in letters from: LLTK and HCSEG (dated September 26,2001), NMFS (dated October 19, 1999 and November 16, 2000), WDFW (dated September 18, 2000), and the broodstock benefit/risk analysis and recommendations developed by NMFS, WDFW and PNPTC (dated September 15, 2000); and (2) with updated understandings of the program technical workgroup, including NOAA Fisheries.

10.1) Proposed fish release levels.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs	0			
Unfed Fry	0			
Fry	0			
Fingerling	110,000	70-90	May/June	John Creek/Hamma Hamma River
Yearling				

Note: 70-90 fpp ~ 83-77 mm fork length

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

Stream, river, or watercourse: John Creek, WRIA 16.0253
Release point: RM 2.0
Major watershed: Hamma Hamma
Basin or Region: Hood Canal, Puget Sound

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

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size(fpp)	Yearling	Avg size
1995					40,000	80		
1996					50,000	80		
1997					70,000	80		
1998					70,000	80		
1999					70,000	80		
2000					70,000	80		
2001					55,400	70		
2002					55,000	80		
2002					106,000	80		
2003					55,000	80		
Average					64,140	80		

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

Fish are released volitionally, during the months of May and June.

10.5 Fish transportation procedures, if applicable.

If it should become necessary, fry may be transported in ambient temperature freshwater to the Hamma Hamma River in a 4' x 4' x 2.5' plastic tote aerated with regulated oxygen via air stone or in a WDFW supplied fish transport truck; transport takes <20 minutes. Fish reared at George Adams Hatchery or LLTK Lilliwaup Hatchery will be transported to the John Creek facility using a fish transport truck with regulated oxygen.

10.6) Acclimation procedures

Fish are reared and acclimated in spring water adjacent to the river.

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

100 percent of the hatchery fish will be released with the adipose fin removed. Both the Hamma Hamma-origin and the George Adams-origin fish will be reared in common lots but will be differentially otolith marked. Coded-wire tags may be applied to assess any differences in survival to return. They will have unique thermal marks applied to their otolith during the eyed egg stage.

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

We do not anticipate any excess fish as egg takes will be regulated to avoid this possibility. Any surplus production will be handled consistent with protocols provided by the Co-Managers.

10.9) Fish health certification procedures applied pre-release.

WDFW fish pathologist will examine the fish prior to release.

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

Fish will be allowed to migrate with floodwaters in response to complete water failure. This is highly unlikely at the conservancy site due to redundant water supplies from multiple springs.

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.

Hamma Hamma chinook smolts are released at a size of about 80 to 100 mm in May when wild smolts are expected to be about 60 to 80 mm long (D. Seiler, WDFW, personal communications, February, 2000). The USFWS (1994) has suggested that juvenile salmonids can consume fish which are one-third or less their own body length. Given this rule of thumb and approximate sizes of hatchery and wild fish at the time chinook are released, predation by hatchery smolts is not expected to be a significant problem. The restoration program will result in an increase in the number of chinook salmon carcasses in freshwater areas and provide a source of nutrients that will benefit other salmonids and non-salmonids.

Releases of George Adams fall chinook from the HCSEG/LLTK Wild Salmon Conservancy (WSC) sites in the Hamma Hamma River (John Creek) are more problematic. There are wild listed summer chum in these streams. Chinook fingerling smolts are scheduled for release in May. Wild summer chum should have cleared the area around the mouth of the Hamma Hamma well before May, so Chinook should pose a low risk to summer chum juveniles. However, there is no way to remove any returning chinook adults, consequently they may pose a high risk of competition with summer chum spawners (Tynan 1999).

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

Note: See section 1.10 for Monitoring and Evaluation. The purpose of a monitoring program is to identify and evaluate the benefits and risks that may derive from the hatchery program. The monitoring program is designed to answer questions of whether the hatchery is providing the benefits intended, while also minimizing or eliminating the risks inherent in the program. A key tool in any monitoring program is having a mechanism to identify each hatchery production group.

Each production group is identified with distinct otolith marks, adipose clips, coded wire tags, blank wire tags or other identification methods as they become available, to allow for evaluation of each particular rearing and/or release strategy. This will allow for selective harvest on hatchery stocks when appropriate, monitoring of interactions of hatchery and wild fish wherever they co-mingle in riverine, estuarine and marine habitats and assessment of the status of the target population. WDFW shall monitor the chinook salmon escapement into the target and non-target Chinook populations to estimate the number of tagged, un-tagged and marked fish escaping into the river each year and the stray rates of hatchery chinook into the rivers.

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

It is intended that all "Performance Indicators" identified in Section1.10 will be monitored and evaluated. Complete funding for all activities has not been secured.

To date, the following "Performance Indicators" **addressing benefits"** have been monitored for the Hamma Hamma chinook supplementation program:

Element 1: Estimate the contribution of restoration program-origin chinook to the naturally spawning population during the recovery process.

1. Differentially mark all hatchery-origin fall chinook fry to allow for distinction from natural-origin fish upon return as adults on the spawning grounds. This will be accomplished by otolith (thermal) marking and adipose fin clipping, or another permanent, effective method determined by the Co-Managers.

2. Conduct spawning ground surveys throughout the fall chinook return to enumerate spawners, and to collect information regarding fish origin (via random sampling of fish heads for otoliths), and age class composition through scale sampling.

3. Estimate the number of naturally spawning hatchery-origin fall chinook contributing to the Hamma Hamma River annual chinook escapement.

4. Estimate the number of natural origin recruits by operation of smolt trap.

To date the following "Performance Indicators" addressing risks" have been monitored for the Hamma Hamma chinook supplementation program:

Element 3: Monitor and evaluate any changes in the genetic, phenotypic, or ecological characteristics of the populations presently affected by the restoration program.

1. Determine if broodstock procurement methods are collecting the required number of adults that represent the demographics of the donor population with minimal injuries and stress to the fish.
    a. Monitor operation of adult collecting operations, ensuring compliance with established broodstock collection protocols for each station.
    b. Monitor timing, duration, composition, and magnitude of the run at the adult collection site.

2. Monitor fish health, specifically as related to cultural practices that can be adapted to prevent fish health problems. Professional fish health specialists supplied by will monitor fish health.
    a. A Fish Health Specialist will conduct the monitoring of fish health. Significant fish mortality to unknown causes will be sampled for histo-pathological study.
    b. The incidence of viral pathogens in chinook broodstock will be determined by sampling fish at spawning in accordance with procedures set forth in the Co-Managers of Washington Fish Health Policy (WDFW and WWTIT 1998).

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

Funding, staffing, and support are available and committed for Monitoring and Evaluation at the current level as described in 11.1, above and as detailed in the Resource Management Plan for Puget Sound Chinook Salmon Hatcheries (Washington Department of Fish and Wildlife and Puget Sound Treaty Tribes, August 23, 2002). Additional funds are needed to support expanded monitoring and evaluation, including data collection and compilation and support for allozyme, DNA and otolith collections and analyses.

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.

It is anticipated that adherence to monitoring and evaluation protocols provided by the Co-Managers will not elevate risk to listed chinook salmon.

SECTION 12. RESEARCH

12.1) Objective or purpose.

Beginning with brood year 2001, a study was conducted with the overall goal to simultaneously access the fry-to-adult survival of fall chinook originating from Hatchery x Hatchery, Acclimatized x Acclimatized, and Natural origin recruits. The null hypothesis was that parental origin has no effect on the fry-to-adult survival of fall chinook. See attachment. The results of the study are being evaluated by a technical workgroup, including NOAA Fisheries, to decide if the research study should be continued.

12.2) Cooperating and funding agencies.

See Section 1

12.3) Principle investigator or project supervisor and staff.

See Section 1

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

Same as Section 2

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

Same as previous Sections

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

September thru May/June

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

See previous Sections

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

See previous Sections

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).

See previous Sections and "take table"

12.10) Alternative methods to achieve project objectives.

Not applicable

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

Not applicable

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.

See previous Sections

SECTION 13. ATTACHMENTS AND CITATIONS

Attachment 1: Broodstock Collection Protocols, Hamma Hamma Chinook Project, Brood Year 1999

Attachment 2: Chinook Broodstock Benefit/Risk Analysis and Recommendations

Attachment 3: Letters from NMFS dated October 19, 1999 and November 16, 2000; Letter from WDFW dated September 18, 2000.

Attachment 4: Letter from LLTK and HCSEG dated September 26,2001

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

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

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

Take Table. Estimated listed salmonid take levels by hatchery activity.

Chinook

ESU/Population	Puget Sound Chinook *(Oncorhynchus tshawytscha)*-Hood Canal
Activity	Hamma Hamma Chinook Program
Location of hatchery activity	Johns Creek, RM 2.0, WRIA 16.0253
Dates of activity	August-June
Hatchery Program Operator	WDFW

Type of Take	Annual Take of Listed Fish by life Stage (number of fish)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass (a)	-	-	Up to100	-
Collect for transport (b)	-	-	-	-
Capture, handle, and release (c)	-	-	Up to18	-
Capture, handle, tag/mark/tissue sample, and release (d)	-	-	-	-
Removal (e.g., broodstock (e)	-	-		-
Intentional lethal take (f)	-	-	Up to 80	-
Unintentional lethal take (g)	Up to 12,600	Up to 5,370	Up to 2	-
Other take (indirect, unintentional) (h)	-	Unknown	-	-

Note: The above numbers assume 100% natural origin adults collected from the Hamma Hamma. Supplementation with fish from George Adams hatchery has been and will be used until total broodstock can be attained through returns to the Hamma Hamma River.

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.

Attachment 1

Broodstock Collection Protocols
Hamma Hamma Chinook Project
Brood Year 1999

Have developed the following procedures to be applied for the collection of broodstock in the Hamma Hamma River he following procedures to be applied for the collection of broodstock in the Hamma Hamma River have been developed by the Kings staff, with technical support from the Washington Department of Fish and Wildlife and Point No Point Treaty Council. All of these techniques were utilized last year with summer chum without any resulting mortality, (other than the expected mortality associated with spawning and extended holding of males in a freshwater environment.)

Capture Techniques

Two capture techniques will be utilized: the hook-and-line capture method, and with a block seine. Two snorkelers will float down the river from the blue hole (river mile 2) to a block seine erected at river mile 1. The snorkelers will either capture fish using the hook-and-line method (the preferred and primary method for collecting broodstock) or they will drive fish downstream into the seine (the secondary, back-up collection method). Regardless of the method used, care will be taken to avoid capture and displacement of chinook in the act of spawning to allow completion of redds.

The Hook-and Line Capture Method

Primarily the snorkelers will use this method. The capture apparatus is a large barbless fishhook, fitted to a metal cap and a heavy-duty line. The cap is attached to the shank of the hook with the opening facing toward the eye. A thin wooden stick is fitted into the cap, creating a gaff hook with a disengaging staff. The diver holds the stick and the line, keeping pressure on the hook, until a fish is engaged. The diver uses the stick to hook the fish on the dorsal half of the caudal peduncle, anterior to or even with the adipose fin. The diver then releases the stick and retrieves the fish with the line.

The Block Seine Capture Method

The block seine will be manned with at least three people. LLTK and WDFW staff in proper fish handling techniques will train the seine operators. All non-targeted fish will be captured by hand from the seine and gently passed downstream Any chinook encountered will be retained up to the weekly broodstock collection goal. Care will be taken to avoid walking on summer chum & chinook redds during operation of the seine. If large numbers of pinks are collecting in the seine, the operators will lift the lead line to allow the fish to escape downstream, rather than handling individual fish.

Number of Fish to be Collected

A weekly target number of fish to be collected has been established based on the expected escapement and early, average, and late run timing curves (see below). A table will be provided by the Co-Managers, based upon these curves, indicates the weekly proportions of the total return that should be collected. These numbers will be reviewed mid-way through the run to accommodate any in season variations in run size or timing. The number of fish to be collected each week will be either the target number or half of the weekly escapement, whichever is lower.

Timing and Duration

Broodstock will be collected during the normal chinook upstream migration. Collection will occur on Monday, Wednesday and Friday of each week, or on Tuesday and Thursday on those weeks that the workweek begins on Tuesday. Collection will last only until the weekly collection goal has been reached, and then discontinued until the following week.

Broodstock Holding

Adults will be segregated by sex and held in PVC tubes. The tubes are approximately 4' long and 10" in diameter, and have large holes drilled in them throughout their length to allow the free exchange of water. These tubes are large enough to accommodate up to three fish each for short periods. However, for this program, only one female will be held per tube, while males may be held up to three per tube. For holding periods greater than 12 hours, loading rates for both sexes will be one fish per tube. The tubes holding fish will be placed in the river in backwater areas and secured to a fixed object on the bank with rope.

Fish will be held in the tubes until spawned. Females will be checked for ripeness upon capture and twice per week thereafter, and will spawned as soon as possible. Males will be live-spawned and returned to the tubes until they either spawn with three or more females or until they expire.

Attachment 2

Chinook Broodstock Benefit/Risk Analysis and Recommendations

Developed by Dr. Jim Myers, NMFS Northwest Fisheries Science Center; Dr. Craig Busack Washington Department of Fish and Wildlife, and Chris Weller, Point No Point Treaty Council
September 15, 2000

1 Hamma Hamma Supplementation Program

Review of the program was done in two phases. First, genetic risks (loss or dilution of native or locally-adapted genetic resources) and demographic risks (risks related to small population abundance or due to over escapement) were evaluated separately. Second, the risks were discussed in the context of other factors (watershed history, etc.).

It was generally agreed that allowing the return adults to spawn naturally without any supplementation offered the least potential for genetic risk and the maximum rate of local adaptation. Using adults returning to the Hamma Hamma River as broodstock for the supplementation program was considered the second best option. There were concerns that this option did not provide the maximum rate of local adaptation. The Hybrid option was viewed as inferior to the all-Hamma Hamma broodstock because of the continued influence of George Adams fish. The George Adams transfer was considered the least desirable.

Two demographic scenarios were considered. If the existing population was under the freshwater habitat-based carrying capacity, then any supplementation would have minimal risk and would be of benefit to the target population (as long as the supplementation did not result in over escapement). The hybrid and all-George Adams options were considered equally beneficial, given that there would be no reduction in the reproductive capacity of the returning adults. The use of both males and females returning to the Hamma Hamma would result in some decrease in natural production, but would contribute supplementation fish to the system (it was assumed the egg to adult survival of hatchery reared eggs was substantially higher than that for naturally-deposited eggs). Lastly, the cessation of supplementation altogether would produce a minimum demographic benefit.

If the existing population (approximately 600 naturally spawning adults), were near or over the existing carrying capacity of the Hamma Hamma River the continuation of the supplementation program would be of little benefit and may be deleterious to the population (depending on the validity of the Beverton Holt or Ricker models). Under these conditions the No Supplementation option would be preferred.

Likely to Have Lower Genetic Risks:

1st. D. No supplementation
2nd. B Returning Hamma Hamma Fish
3rd. C. Hybrid
4th. A. George Adams

Likely to Have Lower Demographic Risks (w/o genetic risks considered):

A. Under carrying capacity

1st. Hybrid
1st. George Adams

2nd. Returning Hamma Hamma Fish
3rd. No supplementation

B. Over carrying capacity

1st. No supplementation

2nd. Supplementation Fish
2nd. Hybrid
2nd. George Adams

Discussion:

It was difficult to evaluate the overall potential for the continued existence of some remnant of the native Hamma Hamma River chinook salmon population. Foremost, was the absence of information on the reproductive success of George Adams fish in the Hamma Hamma River. If supplementation program fish are nearly as successful as native fish, it would be unlikely that a native population remnant could persist. Alternatively, if the supplementation program fish do not successfully reproduce, then NOR adults may still be representative of the native population. Analysis of allozyme data suggests that little difference exists between Hamma Hamma and Skokomish River chinook salmon; however, the sample was taken during one year (1999) and only from adults. Given the small size of the watershed and limited suitable spawning habitat it is unlikely (but not impossible) for native fish to have remained reproductively isolated to any significant degree. However, the locally adapted NORs and what native genetic characteristics they retain are an important resource for recovery.

There was some concern that the current return of adults (NORs and HORs) to the Hamma Hamma River may be sufficiently large to sustain the population without further supplementation. Furthermore, if escapement exceeds carrying capacity further supplementation may be deleterious. Ideally, if further supplementation is required, then the most locally-adapted source available should be utilized.

Ultimately, the success of the program will depend on the sustainability of the population without supplementation. If the population is not sustainable:

a. Limiting habitat factors may need to be corrected
b. The stock may not be suited to the watershed
c. The supplementation stock may not have become locally-adapted
d. Other limiting factors may need to be identified.

Recommendations:

1) Any future releases of supplementation fish should be externally marked (preferably also with a distinctive mark to distinguish them from fish released into other basins –otolith mark, CWT, etc.).
2) Genetic samples should be taken from naturally spawning adults and juveniles out-migrating the following spring.
3) Habitat carrying capacity (present and historical) should be estimated.
4) A clear set of program termination criteria should be developed.
   a) If escapement goals are met for a designated number of years – the program may no longer be necessary.
   b) If the contribution of supplementation fish (adult returns or smolt production) does not exceed a certain level – the program may not provide sufficient benefits to justify its continuation.

Attachment 3

Letters from NMFS dated October 19, 1999 and November 16, 2000.
Letter from WDFW dated September 18, 2000.

October 19, 1999

Mr. Tim Flint, Fish Program Manager
Washington Department of Fish and Wildlife, Region 6
48 Devonshire Road
Montesano, Washington 98563

RE: Decisions on chinook Hatcheries in Hood Canal

Dear Mr. Flint:

The disposition of chinook hatcheries in Hood Canal has been discussed at several meetings in recent months between the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), the co-managers, and private hatchery enhancement groups. This memo summarizes conclusions reached by NMFS based on discussions at these meetings, and provides a reference for current hatchery planning under Sections 7 and 4(d) of the Endangered Species Act (ESA).

NMFS recognizes the management authority and responsibility of the state and the tribes for hatchery production. We also appreciate the sincere intent, commitment to wild fish recovery, and substantial production of the private enhancement groups over the last five years. Their field accomplishments are particularly note worthy for innovation.

The conclusions in this memo reflect NMFS's first priority under the ESA to conserve and protect listed species of naturally produced summer chums and chinook in Hood Canal. If you have any questions or comments on this memo, please feel free to call Derek Poon of my staff
at (206) 526-6550.

EASTERN HOOD CANAL:

As proposed by the co-managers, the three private "wild conservancy sites" at Tahuya, Union, and Dewatto, which reared and released George Adams hatchery chinook for 5 years, are to be discontinued. Returning chinook will continue to spawn naturally and will be monitored; they are not expected to produce a sustainable natural population.

The co-managers proposed closing these facilities for a number of reasons. Bill Waknitz of NMFS conducted an independent analysis of historic data and verified the co-manager’s conclusions. Our findings are as follows. 1) These are summer chum streams and not chinook rivers. 2) Redd superimposition by chinook on chum salmon has occurred and is expected tocontinue. Thus, there is a risk that George Adams hatchery chinook will dig upsummer chum redds resulting in a take as defined under the ESA. 3) Long term chinook production in non-chinook rivers is not expected to produce self sustaining natural chinook populations. 4) A moot point for these streams and rivers, but not for western Hood Canal rivers: George Adams chinook should not be continuously released off site, confounding the process of local adaptation at release sites. This last point is a topic for future discussions.

BIG BEEF CREEK:

The chinook releases at Big Beef Creek appear to pose little risks to chum salmon and can continue as long as redd superimposition with summer chums can be avoided by operation of the weir and other means, and harvest can be managed to avoid adverse impacts on wild chinook. The weir can be operated for its research value in monitoring the reintroduced summer chums and other research projects. The long-term status of the weir, however, should be addressed in the recovery planning process.

WESTERN HOOD CANAL:

The three private "conservancy sites" at Hamma Hamma, Skokomish, and Duckabush, all chinook rivers, can continue rearing and releasing chinook, on this their 5th year of operation. While NMFS prefers to stop importing George Adams eggs to these rivers, we agree with the co-managers that there isn't time to plan for and justify an on-site egg take this year. Therefore, the egg source, and for brood year 1999 only, can be George Adams hatchery. All released fish are to be externally marked.

Efforts are being made over the next several years to determine if native chinook populations exist on these rivers. If native populations exist, brood stocks will be transitioned over to them. If native populations do not exist, brood stocks will be switched to returning F1 hatchery adults, or to other brood stock to be determined by the co-managers and NMFS based on proximity, similarity of habitat, and other characteristics. We anticipate that George Adams fish will not be used for brood year 2000.

OTHER PRIVATE REARING AND RELEASE SITES:

There are a number of other private projects (mostly southern and eastern Hood Canal), which rear and release a variable number of George Adams hatchery chinook, up to several thousand and more, on streams that are not chinook rivers. These are not federally funded. Many, but not all, of these projects are affiliated with schools.

In general, these projects are unlikely to contribute to the recovery of the wild populations, and may confound harvest and genetic management goals. NMFS concluded that all projects not affiliated with schools and not part of the ESU-wide hatchery plan should be discontinued.

Technically, these school projects are not consistent with native stock recovery and should also be terminated. The students should learn that hatcheries need to produce the right fish in the right way to benefit wild fish recovery. On the other hand, rearing salmon in the classroom has important educational values. To reconcile these opposing needs, NMFS concluded that production in school projects should continue but reduced to a level that will not have significant adverse impacts.
Accordingly, it is our understanding that all school projects will have production limits of up to five hundred eggs, to reduce adult returns to an insignificant level. In addition, all fish released at three grams or less need not be externally marked. All fish released at greater than three grams should be adipose clipped, with coded-wire nose tags as optional.

Sincerely,

Stephen H. Smith, Chief
Hatcheries and Inland Fisheries Branch

cc: Al Adams
– Hood Canal Salmon Enhancement Group
Barbara Cairns
– Long Live the King

16 November 2000

Dr. Jeff P. Koenings, Director
Washington Department of Fish and Wildlife
600 Capitol Way N
Olympia, WA 98501-1091

Dear Dr. Koenings:

Thank you for your September 18, 2000 letter seeking National Marine Fisheries Service (NMFS) concurrence with Washington Department of Fish and Wildlife's (WDFW) brood year 2000 broodstock protocols, for the Long Live The Kings (LLTK) and Hood Canal Salmon Enhancement Group (HCSEG) chinook hatcheries at Hamma Hamma and Duckabush Rivers in Hood Canal. Derek Poon of my staff has conveyed our concurrence verbally to Assistant WDFW Director Lew Atkins, and this letter conveys NMFS concurrence with your proposal.

Your letter attached protocols to hybridize George Adams hatchery eggs with F1 Hamma Hamma milt for the Hamma Hamma hatchery, and you proposed to use George Adams eyed eggs for the Duckabush hatchery.

NMFS has taken a position on broodstocks at these hatcheries in an October 19, 1999 letter from Steve Smith to the Co-managers, with copies to LLTK and HCSEG. In this letter, NMFS indicated that F1 hatchery returns should be used for broodstock and transplant of George Adams eggs should stop. We continue to stand by this position, which was vetted with the Co-managers, LLTK and HCSEG, and followed Co-managers recommendations. Nonetheless, your proposal for the 2000 brood year, developed collaboratively between all affected parties, is an acceptable one-year solution.

I understand that the Skokomish Tribe did not concur initially with the use of George Adams eyed eggs at Duckabush, and wanted to stay with conditions outlined in the October 19, 1999 NMFS letter. I appreciate the discussion between David Herrera of the Tribe and Lew Atkins that led to a recent agreement to use George Adams eggs for this year only.

In developing the broodstock protocols in the Hatchery and Genetic Management Plans for the LLTK and HCSEG hatcheries, please use as source documents this letter; your September 18, 2000 letter; our October 19, 1999 letter; and the September 15, 2000 broodstock benefit/risk analysis and recommendations developed by Dr. Jim Myers of the NMFS Northwest Fisheries Science Center, Dr. Craig Busack of your staff, and Chris Weller of the Point No Point Treaty Council.

Thanks for the WDFW leadership in finding solutions to this broodstock issue. If you have any further questions on the NMFS position, please call Derek Poon at 206-526-6550.

Sincerely,

William L. Robinson
Assistant Regional Administrator
for Sustainable Fisheries

cc: Donna Darm, NMFS
Dr. Robin Waples, NMFS
Gerry Jackson, USFWS
David Herrera, Skokomish Tribe
Chris Weller, PNPTC
Barbara Cairns, LLTK
Dr. Al Adams, HCSEG

September 18, 2000

Mr. Derek Poon
National Marine Fisheries Service
7600 Sandpoint Way N.E., Building 3
Seattle, Washington 98115-6349

Dear Mr. Poon:

The enclosed information is a synopsis of the protocols required for implementation of the "Hamma Hamma F1 Milt/George Adams Chinook Eggs" option for year 2000 only. This option was discussed at length at our joint meeting September 6, 2000 at Washington Department of Fish and Wildlife (WDFW) and in subsequent discussions, e-mails, and telephone calls between the involved parties.

Based on our joint discussions regarding the various options presented by the group, an internal science review and risk assessment by WDFW, joint review by NMFS and WDFW science staff regarding the benefits associated with this option, as well as consideration of time constraints we face in implementing a plan for this season, WDFW believes the F1 Milt option for the Hamma Hamma is the right decision for this year.

This option provides:

1) Direct benefits to the resource;
2) Movement toward locally adapted stocks;
3) Maximum protection for the spawning F1 adults as the males will be live-spawned and all F1 females will be allowed to spawn in the wild;
4) Integrity of the project goals Long Live the Kings and the Hood Canal Salmon Enhancement Group have for the Hamma Hamma; and
5) The opportunity to implement an option that is sensitive to all of our needs and the time constraints we manage under.

We are approximately 25 percent into the chinook adult return to the Hamma Hamma for this year. As you see in the attached protocols, full utilization of the various components of the run is essential. This requires that we begin collecting milt no later than next week, the week of September 18, 2000, and implement this option.

Despite our efforts to come to an understanding of the issues on the Duckabush, considerable uncertainty remains regarding the appropriate steps to take in 2000. Though similar to the recovery program on the Hamma Hamma, the program initiated on the Duckabush has apparently failed to result in a similar level of escapement. The lack of escapement increases the risk of immediately implementing the use of locally adapted stocks. In contrast, providing George Adams eyed eggs for one more year and working together to identify and remedy limitations to the success of the Duckabush program appears to present limited risk to the stock and may provide additional options for recovery actions in subsequent years. Because of our desire to balance the risks to the stock of our program in the Duckabush, this year, WDFW will provide George Adams eggs for one additional year unless absent any NMFS analysis that indicates this approach will result in a taking of listed fish.

WDFW is committed to working with our partners, and with NMFS, to plan and implement a long-term recovery strategy for both systems before the fall of 2001. We believe that by working through such issues and resolving them with our partners is the best way to recover salmon. Thus, planning for next year would begin immediately to ensure agreement on an approach and readiness to implement that approach next fall.

We appreciate your earliest response regarding this issue. Again, we anticipate needing to implement this option the week of September 18 if we are to be successful. Your timely comments are appreciated.

Sincerely,

Jeff P. Koenings, Ph.D.
Director

JK:dr

cc: Lew Atkins, Assistant Director
Jo Wadsworth, Deputy Assistant Director
Phil Anderson, Intergovernmental Policy
Jim Scott, Fish Chief Scientist
Tim Flint, Regional Fish Program Manager
Thom Johnson, District Manager

Hamma Hamma River Chinook Salmon Supplementation Program, Brood Year 2000

Synopsis of Protocols for the "Hamma Hamma F1 Milt x George Adams Hatchery Eggs" Option

September 2000

Production level: 70,000-fingerling release from John Creek facility on Hamma Hamma River.

Egg take goal: 78,000 green eggs; based on 90% survival from green egg to release.

Number of female chinook needed: Based on an average of 3500 eggs per female, could be accomplished with about 22 females. However, recommend that partial (approximately half) lots of eggs from each of 50 females be used to achieve egg take goal of 78,000 green eggs. Estimates of the cumulative number of green eggs will be made after each egg take and the number of female chinook needed may be adjusted to reach, but not exceed, the egg take goal of 78,000 green eggs.

Number of male chinook needed: a minimum of 25 males

Broodstock selection:

Hamma Hamma males: Males from Hamma Hamma used for broodstock will represent the naturally spawning donor population with respect to run timing, size, age, and any other traits identified as important for long-term fitness. Collection of males will be based on the average weekly run timing developed by WDFW from brood years 1998 and 1999 during the period from August 27 through November 24. In practice, to provide flexibility and to allow for early/late run timing during 2000, the number of males collected during 2000 will represent the timing during each of three two-week periods: 6 males during September 10-23, 13 males during September 24-October 7, and 6 males during October 8-21. Males will be collected, held in PVC tubes in the Hamma Hamma River until ripe, and live spawned. Males will not be sampled for virology.

George Adams Hatchery females: Ripe females will be selected to coincide with the collection and spawning of ripe Hamma Hamma males. Females will be spawned at George Adams Hatchery and all fish health protocols followed. Samples will be transported to WDFW virology lab in Olympia and preliminary results will be available in about one week. Partial lots of green eggs from two or more females will be combined and then used as "one" female in the factorial crosses (see mating).

Mating: Spawning protocols are done in accordance with the co-managers fish health policy. Mating protocols and data collection developed by Steve Schroder of WDFW Science Division which are currently in use for the summer chum supplementation program on the Hamma Hamma will be used for Hamma Hamma chinook. Green eggs will be transported to John Creek and fertilized there. Eggs will be fertilized factorially (2x2 or 3x3) or using at least a 1:1 spawning ratio. Back-up males will be used as a precautionary measure when available.

Incubation and rearing : All incubation and rearing will take place at John Creek facility on the Hamma Hamma River. All eggs will be water hardened in iodophor and placed in remote site incubators at John Creek facility. Each day's egg take will be maintained in a single incubator and each female will be numbered and tracked. Although it is anticipated that it is a low likelihood, the entire day's egg take will be destroyed if virology testing proves positive. Eyed eggs will be marked with a unique otolith mark at John Creek facility. Fish will volitionally migrate from incubators to raceways for initial rearing. All fish will be marked with an adipose fin clip prior to ponding in natural ponds. Fish are released volitionally into spring water sources on John Creek, a Hamma Hamma River tributary. Production goal is a release of 70,000 chinook during April-May at a size of 80 fish per pound. WDFW fish pathologist routinely checks fish health during incubation, rearing and prior to release.

Hood Canal Salmon Enhancement Group and Long Live the Kings staff, with technical support from the Washington Department of Fish and Wildlife and Point No Point Treaty Council. All of these techniques were utilized last year with summer chum without any resulting mortality, (other than the expected mortality associated with spawning and extended holding of males in a freshwater environment.)

Capture Techniques

Two capture techniques will be utilized: the hook-and-line capture method, and with a block seine. Two snorkelers will float down the river from the blue hole (river mile 2) to a block seine erected at river mile 1. The snorkelers will either capture fish using the hook-and-line method (the preferred and primary method for collecting broodstock) or they will drive fish downstream into the seine (the secondary, back-up collection method). Regardless of the method used, care will be taken to avoid capture and displacement of chinook in the act of spawning to allow completion of redds.

The Hood-and Line Capture Method

This method will be used primarily by the snorkelers. The capture apparatus is a large barbless fish hook, fitted to a metal cap and a heavy duty line. The cap is attached to the shank of the hook with the opening facing toward the eye. A thin wooden stick is fitted into the cap, creating a gaff hook with a disengaging staff. The diver holds the stick and the line, keeping pressure on the hook, until a fish is engaged. The diver uses the stick to hook the fish on the dorsal half of the caudal peduncle, anterior to or even with the adipose fin. The diver then releases the stick and retrieves the fish with the line.

The Block Seine Capture Method

The block seine will be manned with at least three people. The seine operators will be trained by LLTK and WDFW staff in proper fish handling techniques. All non-targeted fish will be captured by hand from the seine and gently passed downstream Any chinook encountered will be retained up to the weekly broodstock collection goal. Care will be taken to avoid walking on summer chum & chinook redds during operation of the seine. If large numbers of pinks are collecting in the seine, the operators will lift the lead line to allow the fish to escape downstream, rather than handling individual fish.

Number of Fish to be Collected

A weekly target number of fish to be collected has been established based on the expected escapement and “early”, average, and “late” run timing curves (see below). The table will be provided by the Co-Managers, based upon these curves, indicates the weekly proportions of the total return that should be collected. These numbers will be reviewed mid-way through the run to accommodate any in season variations in run size or timing. The number of fish to be collected each week will be either the target number or half of the weekly escapement, whichever is lower.

Timing and Duration

Broodstock will be collected during the normal chinook upstream migration. Collection will occur on Monday, Wednesday and Friday of each week, or on Tuesday and Thursday on those weeks that the work week begins on Tuesday. Collection will last only until the weekly collection goal has been reached, and then discontinued until the following week.

Broodstock Holding

Adults will be segregated by sex and held in PVC tubes. The tubes are approximately 4’ long and 10” in diameter, and have large holes drilled in them throughout their length to allow the free exchange of water. These tubes are large enough to accommodate up to three fish each for short periods. However, for this program, only one female will be held per tube, while males may be held up to three per tube. For holding periods greater than 12 hours, loading rates for both sexes will be one fish per tube. The tubes holding fish will be placed in the river in backwater areas and secured to a fixed object on the bank with rope.

Fish will be held in the tubes until spawned. Females will be checked for ripeness upon capture and twice per week thereafter, and will spawned as soon as possible. Males will be live-spawned and returned to the tubes until they either spawn with three or more females or until they expire.

Attachment 2

Chinook Broodstock Benefit/Risk Analysis and Recommendations

Developed by Dr. Jim Myers, NMFS Northwest Fisheries Science Center; Dr. Craig Busack Washington Department of Fish and Wildlife, and Chris Weller, Point No Point Treaty Council
September 15, 2000

1 Hamma Hamma Supplementation Program

Review of the program was done in two phases. First, genetic risks (loss or dilution of native or locally-adapted genetic resources) and demographic risks (risks related to small population abundance or due to over escapement) were evaluated separately. Second, the risks were discussed in the context of other factors (watershed history, etc.).

It was generally agreed that allowing the return adults to spawn naturally without any supplementation offered the least potential for genetic risk and the maximum rate of local adaptation. Using adults returning to the Hamma Hamma River as broodstock for the supplementation program was considered the second best option. There were concerns that this option did not provide the maximum rate of local adaptation. The Hybrid option was viewed as inferior to the all-Hamma Hamma broodstock because of the continued influence of George Adams fish. The George Adams transfer was considered the least desirable.

Two demographic scenarios were considered. If the existing population was under the freshwater habitat-based carrying capacity, then any supplementation would have minimal risk and would be of benefit to the target population (as long as the supplementation did not result in overescapement). The hybrid and all-George Adams options were considered equally beneficial, given that there would be no reduction in the reproductive capacity of the returning adults. The use of both males and females returning to the Hamma Hamma would result in some decrease in natural production, but would contribute supplementation fish to the system (it was assumed the egg to adult survival of hatchery reared eggs was substantially higher than that for naturally-deposited eggs). Lastly, the cessation of supplementation altogether would produce a minimum demographic benefit.

If the existing population (approximately 600 naturally spawning adults), is near or over the existing carrying capacity of the Hamma Hamma River the continuation of the supplementation program would be of little benefit and may be deleterious to the population (depending on the validity of the Beverton Holt or Ricker models). Under these conditions the No Supplementation option would be preferred.

Likely to Have Lower Genetic Risks:

1st. D. No supplementation
2nd. B Returning Hamma Hamma Fish
3rd. C. Hybrid
4th. A. George Adams

Likely to Have Lower Demographic Risks (w/o genetic risks considered):

A. Under carrying capacity
1st. Hybrid
1st. George Adams

2nd. Returning Hamma Hamma Fish
3rd. No supplementation

B. Over carrying capacity
1st. No supplementation

2nd. Supplementation Fish
2nd. Hybrid
2nd. George Adams

Discussion:

It was difficult to evaluate the overall potential for the continued existence of some remnant of the native Hamma Hamma River chinook salmon population. Foremost, was the absence of information on the reproductive success of George Adams fish in the Hamma Hamma River. If supplementation program fish are nearly as successful as native fish, it would be unlikely that a native population remnant could persist. Alternatively, if supplementation program fish do not successfully reproduce then NOR adults may still be representative of the native population. Analysis of allozyme data suggests that little difference exists between Hamma Hamma and Skokomish River chinook salmon; however, the sample was taken during one year (1999) and only from adults. Given the small size of the watershed and limited suitable spawning habitat it is unlikely (but not impossible) for native fish to have remained reproductively isolated to any significant degree. However, the locally adapted NORs and what native genetic characteristics they retain are an important resource for recovery.

There was some concern that the current return of adults (NORs and HORs) to the Hamma Hamma River may be sufficiently large to sustain the population without further supplementation. Furthermore, if escapement exceeds carrying capacity further supplementation may be deleterious. Ideally, if further supplementation is required, then the most locally-adapted source available should be utilized.

Ultimately, the success of the program will depend on the sustainability of the population without supplementation. If the population is not sustainable:

e. limiting habitat factors may need to be corrected
f. the stock may not be suited to the watershed
g. the supplementation stock may not have become locally-adapted
h. other limiting factors may need to be identified.

Recommendations:

5) Any future releases of supplementation fish should be externally marked (preferably also with a distinctive mark to distinguish them from fish released into other basins –otolith mark, CWT, etc.).
6) Genetic samples should be taken from naturally spawning adults and juveniles outmigrating the following spring.
7) Habitat carrying capacity (present and historical) should be estimated.
8) A clear set of program termination criteria should be developed.
   a) If escapement goals are met for a designated number of years – the program may no longer be necessary.
   b) If the contribution of supplementation fish (adult returns or smolt production) does not exceed a certain level – the program may not provide sufficient benefits to justify its continuation.

Attachment 3
Letters from NMFS dated October 19, 1999 and November 16, 2000.
Letter from WDFW dated September 18, 2000.

October 19, 1999

Mr. Tim Flint, Fish Program Manager
Washington Department of Fish and Wildlife, Region 6
48 Devonshire Road
Montesano, Washington 98563

RE: Decisions on chinook Hatcheries in Hood Canal

Dear Mr. Flint:

The disposition of chinook hatcheries in Hood Canal has been discussed at several meetings in recent months between the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), the co-managers, and private hatchery enhancement groups. This memo summarizes conclusions reached by NMFS based on discussions at these meetings, and provides a reference for current hatchery planning under Sections 7 and 4(d) of the Endangered Species Act (ESA).

NMFS recognizes the management authority and responsibility of the state and the tribes for hatchery production. We also appreciate the sincere intent, commitment to wild fish recovery, and substantial production of the private enhancement groups over the last five years. Their field accomplishments are particularly note worthy for innovation.

The conclusions in this memo reflect NMFS's first priority under the ESA to conserve and protect listed species of naturally produced summer chums and chinook in Hood Canal. If you have any questions or comments on this memo, please feel free to call Derek Poon of my staff
at (206) 526-6550.

EASTERN HOOD CANAL:

As proposed by the co-managers, the three private "wild conservancy sites" at Tahuya, Union, and Dewatto, which reared and released George Adams hatchery chinook for 5 years, are to be discontinued. Returning chinook will continue to spawn naturally and will be monitored; they are not expected to produce a sustainable natural population.

The co-managers proposed closing these facilities for a number of reasons. Bill Waknitz of NMFS conducted an independent analysis of historic data and verified the co-manager's conclusions. Our findings are as follows. 1) These are summer chum streams and not chinook rivers. 2) Redd superimposition by chinook on chum salmon has occurred and is expected to

continue. Thus, there is a risk that George Adams hatchery chinook will dig up
summer chum redds resulting in a take as defined under the ESA. 3) Long term chinook
production in non-chinook rivers is not expected to produce self sustaining natural chinook populations. 4) A moot point for these streams and rivers, but not for western Hood Canal rivers: George Adams chinook should not be continuously released off site, confounding the process of local adaptation at release sites. This last point is a topic for future discussions.

BIG BEEF CREEK:

The chinook releases at Big Beef Creek appear to pose little risks to chum salmon and can continue as long as

redd superimposition with summer chums can be avoided by operation of the weir and other means, and harvest can be managed to avoid adverse impacts on wild chinook. The weir can be operated for its research value in monitoring the reintroduced summer chums and other research projects. The long-term status of the weir, however, should be addressed in the recovery planning process.

WESTERN HOOD CANAL:

The three private "conservancy sites" at Hamma Hamma, Skokomish, and Duckabush, all chinook rivers, can continue rearing and releasing chinook, on this their 5th year of operation. While NMFS prefers to stop importing George Adams eggs to these rivers, we agree with the co-managers that there isn't time to plan for and justify an on-site egg take this year. Therefore, the egg source, and for brood year 1999 only, can be George Adams hatchery. All released fish are to be externally marked.

Efforts are being made over the next several years to determine if native chinook populations exist on these rivers. If native populations exist, brood stocks will be transitioned over to them. If native populations do not exist, brood stocks will be switched to returning F1 hatchery adults, or to other brood stock to be determined by the co-managers and NMFS based on proximity, similarity of habitat, and other characteristics. We anticipate that George Adams fish will not be used for brood year 2000.

OTHER PRIVATE REARING AND RELEASE SITES:

There are a number of other private projects (mostly southern and eastern Hood Canal) which rear and release a variable number of George Adams hatchery chinook, up to several thousand and more, on streams that are not chinook rivers. These are not federally funded. Many, but not all, of these projects are affiliated with schools.

In general, these projects are unlikely to contribute to the recovery of the wild populations, and may confound harvest and genetic management goals. NMFS concluded that all projects not affiliated with schools and not part of the ESU-wide hatchery plan should be discontinued.

Technically, these school projects are not consistent with native stock recovery and should also be terminated. The students should learn that hatcheries need to produce the right fish in the right way to benefit wild fish recovery. On the other hand, rearing salmon in the classroom has important educational values. To reconcile these opposing needs, NMFS concluded that production in school projects should continue but reduced to a level that will not have significant adverse impacts.

Accordingly, it is our understanding that all school projects will have production limits of up to five hundred eggs, to reduce adult returns to an insignificant level. In addition, all fish released at three grams or less need not be externally marked. All fish released at greater than three grams should be adipose clipped, with coded-wire nose tags as optional.

Sincerely,

Stephen H. Smith, Chief
Hatcheries and Inland Fisheries Branch

cc: Al Adams
– Hood Canal Salmon Enhancement Group
Barbara Cairns
– Long Live the King

16 November 2000

Dr. Jeff P. Koenings, Director
Washington Department of Fish and Wildlife
600 Capitol Way N
Olympia, WA 98501-1091

Dear Dr. Koenings:

Thank you for your September 18, 2000 letter seeking National Marine Fisheries Service (NMFS) concurrence with Washington Department of Fish and Wildlife's (WDFW) brood year 2000 broodstock protocols, for the Long Live The Kings (LLTK) and Hood Canal Salmon Enhancement Group (HCSEG) chinook hatcheries at Hamma Hamma and Duckabush Rivers in Hood Canal. Derek Poon of my staff has conveyed our concurrence verbally to Assistant WDFW Director Lew Atkins, and this letter conveys NMFS concurrence with your proposal.

Your letter attached protocols to hybridize George Adams hatchery eggs with F1 Hamma Hamma milt for the Hamma Hamma hatchery, and you proposed to use George Adams eyed eggs for the Duckabush hatchery.

NMFS has taken a position on broodstocks at these hatcheries in a October 19, 1999 letter from Steve Smith to the Co-managers, with copies to LLTK and HCSEG. In this letter, NMFS indicated that F1 hatchery returns should be used for broodstock and transplant of George Adams eggs should stop. We continue to stand by this position, which was vetted with the Co-managers, LLTK and HCSEG, and followed Co-managers recommendations. Nonetheless, your proposal for the 2000 brood year, developed collaboratively between all affected parties, is an acceptable one-year solution.

I understand that the Skokomish Tribe did not concur initially with the use of George Adams eyed eggs at Duckabush, and wanted to stay with conditions outlined in the October 19, 1999 NMFS letter. I appreciate the discussion between David Herrera of the Tribe and Lew Atkins that led to a recent agreement to use George Adams eggs for this year only.

In developing the broodstock protocols in the Hatchery and Genetic Management Plans for the LLTK and HCSEG hatcheries, please use as source documents this letter; your September 18, 2000 letter; our October 19, 1999 letter; and the September 15, 2000 broodstock benefit/risk analysis and recommendations developed by Dr. Jim Myers of the NMFS Northwest Fisheries Science Center, Dr. Craig Busack of your staff, and Chris Weller of the Point No Point Treaty Council.

Thanks for the WDFW leadership in finding solutions to this broodstock issue. If you have any further questions on the NMFS position, please call Derek Poon at 206-526-6550.

Sincerely,

William L. Robinson
Assistant Regional Administrator
for Sustainable Fisheries

cc: Donna Darm, NMFS
Dr. Robin Waples, NMFS
Gerry Jackson, USFWS

David Herrera, Skokomish Tribe
Chris Weller, PNPTC
Barbara Cairns, LLTK
Dr. Al Adams, HCSEG

September 18, 2000

Mr. Derek Poon
National Marine Fisheries Service
7600 Sandpoint Way N.E., Building 3
Seattle, Washington 98115-6349

Dear Mr. Poon:

The enclosed information is a synopsis of the protocols required for implementation of the "Hamma Hamma F1 Milt/George Adams Chinook Eggs" option for year 2000 only. This option was discussed at length at our joint meeting September 6, 2000 at Washington Department of Fish and Wildlife (WDFW) and in subsequent discussions, e-mails, and telephone calls between the involved parties.

Based on our joint discussions regarding the various options presented by the group, an internal science review and risk assessment by WDFW, joint review by NMFS and WDFW science staff regarding the benefits associated with this option, as well as consideration of time constraints we face in implementing a plan for this season, WDFW believes the F1 Milt option for the Hamma Hamma is the right decision for this year.

This option provides:

6) Direct benefits to the resource;
7) Movement toward locally adapted stocks;
8) Maximum protection for the spawning F1 adults as the males will be live-spawned and all F1 females will be allowed to spawn in the wild;
9) Integrity of the project goals Long Live the Kings and the Hood Canal Salmon Enhancement Group have for the Hamma Hamma; and
10) The opportunity to implement an option that is sensitive to all of our needs and the time constraints we manage under.

We are approximately 25 percent into the chinook adult return to the Hamma Hamma for this year. As you see in the attached protocols, full utilization of the various components of the run is essential. This requires that we begin collecting milt no later than next week, the week of September 18, 2000, and implement this option.

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WDFW is committed to working with our partners, and with NMFS, to plan and implement a long-term recovery strategy for both systems before the fall of 2001. We believe that by working through such issues and resolving them with our partners is the best way to recover

salmon. Thus, planning for next year would begin immediately to ensure agreement on an approach and readiness to implement that approach next fall.

We appreciate your earliest response regarding this issue. Again, we anticipate needing to implement this option the week of September 18 if we are to be successful. Your timely comments are appreciated.

Sincerely,

Jeff P. Koenings, Ph.D.
Director

JK:dr

cc: Lew Atkins, Assistant Director
Jo Wadsworth, Deputy Assistant Director
Phil Anderson, Intergovernmental Policy
Jim Scott, Fish Chief Scientist
Tim Flint, Regional Fish Program Manager
Thom Johnson, District Manager

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September, 2000

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eggs will be marked with a unique otolith mark at John Creek facility. Fish will volitionally migrate from incubators to raceways for initial rearing. All fish will be marked with an adipose fin clip prior to ponding in natural ponds. Fish are released volitionally into spring water sources on John Creek, a Hamma Hamma River tributary. Production goal is a release of 70,000 chinook during April-May at a size of 80 fish per pound. Fish health is routinely checked by WDFW fish pathologist during incubation, rearing and prior to release.

DRAFT DRAFT DRAFT

HAMMA HAMMA FALL CHINOOK COMPOSITE STRATEGY EVALUATION STUDY

Abstract

Overall goal: To simultaneously access the fry-to-adult survival of fall chinook originating from Hatchery x Hatchery, Acclimatized x Acclimatized, and Natural origin recruits. Null Hypothesis: Parental origin has no effect on the fry-to-adult survival of fall chinook salmon

Provisional Approach:

1) Capture fall chinook returning to the Hamma Hamma River, artificially mate the fish in a factorial fashion, incubate, thermally mark, rear in conservancy ponds, and release. The offspring of these fish will be used to create the Acclimatized x Acclimatized treatment group. They represent fish that have at least demonstrated a competency to return to the Hamma Hamma, and may be one or more generations removed from hatchery selection pressures.
2) Import eyed eggs from George Adams, thermally mark the eggs, rear in conservancy ponds, and release. These eggs will be used to create the Hatchery x Hatchery treatment group. They have originated from parental fish that have been exposed to hatchery selection pressures for multiple generations.
3) Natural origin fry will be produced by fall chinook allowed to reproduce naturally in the Hamma Hamma River. They will originate from parental fish that will have been removed from hatchery life for varying periods of time, from none (a hatchery fish returning to spawn) to one or more generations

Procedural Steps for the creation and monitoring of these populations:

1) All adults used to create the Acclimatized x Acclimatized and Hatchery x Hatchery populations will have extensive biological information collected on them and the survival of their offspring. For example, age, weight, length, egg size, reproductive effort, DNA, pathology samples, egg-to-eyed egg survival, eyed egg to fry survival, and occurrence of monstrosities will be recorded
2) Distinct thermal codes will be induced into the otoliths of the fry representing each type of cross. Marking will occur at the eyed stage. After marking, the fish will be placed into RSIs that empty into conservancy ponds. The number of eyed eggs representing each cross will be calculated by using standard gravimetric methods. Several RSI options exist. In one case, a known number of eyed eggs from each treatment can be placed into the same RSI and incubated. Conversely, eggs from each treatment can be placed into separate RSIs, two per conservancy pond. The use of separate RSIs would be very helpful, since at the end of the incubation period, the number of dead eggs, alevins, and monstrosities remaining in each RSI could be counted and subtracted from the total number of eyed eggs placed into the RSI. This would then give us a good initial number of fry representing each treatment that entered the conservancy pond. If fry from both treatments were incubated in the same RSI, we could calculate the number of fry entering the pond but would be uncertain of their precise origin.
3) To help alleviate any pond effects, it is important that fish representing each of these two treatments rear in the same conservancy ponds. Multiple conservancy ponds could be used.
4) The standard practice is to stop feeding the fish after a set rearing period and let them volitionally exit their rearing ponds. This would be continued, with two modifications. First, we would want to serially sample the fish as they exited the ponds to determine the proportions of Hatchery and Acclimatized fry leaving over the course of the out-migration period. Second, the number of fish leaving a pond would be determined on a

daily basis. Probably the best way to accomplish both of these objectives would be establish a net pen, or a circular tank lined with a net at the outlet of the conservancy exit pipe. This container would be checked daily, the fry could be counted gravimetrically or by hand, or by an automatic counter. A random sample of fish would then be removed, lengths and weights would be taken on them and their otoliths would be decoded to determine their treatment origin. The remaining fish would be released that night. The automatic fish counter would be the preferred option, as it would reduce stress caused by handling. The overall goals of the above work are to:

a) Determine the total number of fry entering the Hamma Hamma River that have originated from the two treatment groups
b) Ascertain whether the out-migration timing of fish originating from the two treatments differ
c) Evaluate if any size differences exist in fish representing each treatment
d) Determine if any differential survival occurred during the rearing phase, that is while the fish were held in the conservancy ponds

5) A screw trap will be established in the Hamma Hamma River to calculate the number of Natural-Origin Recruits leaving the system. In addition, it will also be used to assess the number of Hatchery and Acclimated conservancy fish exiting the basin. The trap will be installed above the influence of high tides to prevent fish passing by the trap multiple times. Trap efficiency will be routinely assessed by: 1) staining some of the captured fall chinook with Bismarck Brown, 2) releasing them far enough above the trap so that can redistribute themselves in the river, 3) counting the number of marked fall chinook recaptured, and 4) determining a trapping rate by simply dividing the number of recovered marks by the number released. If possible a stream gauge should be set up so that a relationship between stream flow and capture rate can be established. The screw trap should begin fishing in mid-January and sampling should continue through mid July or longer depending upon catch rates. Routine fish size measurements will be taken on a sample of the captured fish. All fall chinook captured prior to the first liberation of conservancy fish will be regarded as NORs (Natural Origin Recruits). Once conservancy fish have been liberated into the Hamma Hamma then random samples of captured fry will have to be retained and examined to determine their origin (i.e. their otoliths will have to be decoded). Lengths and weights will be taken on the sampled fish. The overall goals of the trapping work are to:
   a) Characterize the number, size, timing, and type of fall chinook leaving the Hamma Hamma River (We will therefore know the number of fall chinook originating from each treatment that left the Hamma Hamma River. We will also have an idea of their size, and when they left the system.
   b) Compare the survival of Hatchery and Acclimatized conservancy fish from release to the Hamma Hamma trap
   c) Compare the residency time of Hatchery and Acclimatized conservancy fish in the Hamma Hamma River.
6) Perform stream surveys in the Hamma Hamma River. Otoliths will be collected from adult fish returning the Hamma Hamma River to determine if NORs, Hatchery or Acclimatized fish survive at the same or different rates to the adult stage. The null hypothesis is that there is no difference in survival among the three groups from the fry stage to adulthood. If the study can be repeated for an entire brood cycle (minimum of three years maximum of five years) data could be pooled across brood years to increase power. It may also be possible to investigate whether any interactions have occurred among survival of treatment groups and treatment types. Recovered otoliths would be decoded and analyzed to provide this information.
7) It is recommended that managers and operators of this program meet at least once a year, prior to brood stock capture, to assess the results of the previous year and to identify needed changes to this program.