HATCHERYAND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Port Gamble Hatchery Fall Chum
Species or Hatchery Stock:	Fall chum salmon, *Oncorhynchus keta*, Little Boston Creek stock (originally Finch Creek stock)
Agency/Operator:	Port Gamble S'Klallam Tribe
Watershed and Region:	Little Boston Creek (WRIA 15.0350), Port Gamble Bay, Hood Canal, Washington State
Date Submitted:	March 17, 2003
Date Last Updated:	

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.
Port Gamble S'Klallam Tribal Hatchery

1.2) Species and population (or stock) under propagation, and ESA status.
Fall chum salmon, *Oncorhynchus keta*, Little Boston Creek stock (originally Finch Creek stock). ESA status: Not listed.

1.3) Responsible organization and individuals

Agency lead contact:

Name (and title):	Sharon Purser, Natural Resources Program Administrator
Agency or Tribe:	Port Gamble S'Klallam Tribe
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On-site operations staff lead:

Name (and title):	Tim Seachord, Hatchery Manager
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:
Point No Point Treaty Council: technical assistance since the hatchery operations began in late 1976. Northwest Indian Fisheries Commission: Fish health services.

1.4) Funding source, staffing level, and annual hatchery program operational costs.
Source: Bureau of Indian Affairs through Port Gamble S'Klallam Tribe
Staffing: Tim Seachord: Hatchery Manager, Dennis DeCoteau: Hatchery Technician
Operational costs:

1.5) Location(s) of hatchery and associated facilities.
Hatchery is located at mouth of Little Boston Creek (WRIA 15.0350) at northeast end of Port Gamble Bay in northern Hood Canal. Facilities include a fish weir and adult collection pond in the creek, and adjacent fish incubation and rearing facilities.

1.6) Type of program.

Isolated Harvest

1.7) Purpose (Goal) of program.

Fisheries augmentation. The goal of the program is to provide local fall chum salmon fishing opportunity, promoting the stability and viability of treaty and non-treaty fisheries.

1.8) Justification for the program.

The Port Gamble Hatchery fall chum program has produced a return of adult salmon to Port Gamble Bay since its first release of fall chum fry in 1977 (initial return of three year old adults in 1979). The returning fall chum salmon have provided opportunities for treaty and non-treaty harvest in pre-terminal areas as well as Port Gamble Bay. For many years, the program was dependent on transfers of eggs (Finch Creek stock) from the Washington Department of Fish and Wildlife Hood Canal hatcheries. However, beginning six years ago, the program has been successful in establishing a broodstock based on adult returns to the Port Gamble hatchery.

The Port Gamble Hatchery fall chum program releases fed fry into Little Boston Creek on Port Gamble Bay. There are no listed species in tributaries of the bay or near vicinity and impacts of the fall chum on either the threatened Hood Canal summer chum salmon or the threatened Puget Sound chinook salmon would be expected to be minimal to non-existent. However, because fall chum have similarities in life history to summer chum and potential interactions may occur in the estuary, applicable risk avoidance measures described in the Summer Chum Salmon Conservation Initiative (SCSCI)(WDFW and Point No Point Treaty Tribes 2000), will be followed by the Port Gamble Hatchery fall chum program. These measures, addressing potential effects from early life history competition and behavioral modification, and fish disease, are included in the performance standards described below in section 1.9 and are described in more detail in sections 2.2.1 and 3.5. The risk aversion measures pertaining to fish disease may also apply to Puget Sound chinook; however, because of differences in fish size and life history, the Port Gamble Hatchery fall chum otherwise are not expected to pose a risk to Puget Sound chinook.

1.9) List of program "Performance Standards" and

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

The following performance standards and associated performance indicators apply to the Port Gamble Hatchery fall chum program.

Categories	Performance Standards	Performance Indicators
Hatchery Fish Production	1) Broodstock escapement goal of 1,300 spawners. Assumes 2:1 male to female ratio.	1) Records of all hatchery adult returns and their distribution (spawned, surplused, etc.). ("benefits")
	2) Egg collection goal of 1.2 million eggs. Assumes approximately 2,800 eggs per female	2) Inventories of live and dead eggs. ("benefits")
	3) Release goal of 950,000 fed fry at 400 fish per pound. Assumes green egg to release survival of .80. (Note that size at release goal of 400 fish per pound in management plans and future brood document should be changed to 550 fish per pound. See section 10.3.)	3) Estimates of fish numbers and size, and records of fish culture (e.g., mortalities, growth, feeding, disease incidents, etc.) - ("benefits")
	4) Return rate goal of 0.005 or better, potentially contributing at least 3,000 adult fall chum to fisheries.	4) Biological data record collected from returning adults including age from scale samples. Reconstruction of runs based on hatchery escapement, age and catch data. ("benefits")
	5) Production goals consistent with the provisions of the Puget Sound Salmon Management Plan, the Hood Canal Salmon Management Plan and all other management agreements of the Co-managers.	5) Hatchery spawning and release records consistent on average with future brood document and other provisions of co-managers' agreed upon management plans and policies. ("benefits")
Hatchery Fish spawning	6) Collect broodstock proportional to returns throughout adult return period.	6) Records of adult returns, fish spawned and egg takes by day. ("benefits")
	7) Spawn at ratio of one male to one female.	7) Records of mating (procedures and results, including male to female ratios) by day. ("benefits")
Hatchery	8) Goal is to rear fish in a relatively	8) Estimates of fish numbers and size,

Fish Rearing	stress-free environment that promotes good growth and survival so that when released, the fish will be healthy and in good condition.	fish mortalities, water flows, fish loading, water quality measurements (temperature and oxygen), in-hatchery transfers (e.g. from incubation trays to raceways), feeding and growth rates. ("benefits")
Hatchery Fish Release	9) Goal is to release fish in a group and at night during high tide to reduce potential predation on newly released fry. 10) Fish released after April 1 to avoid any competition or behavior modification effects on summer chum salmon.	9) &10) Records of date, time, tide and general environmental conditions at release. Also, estimates of fish numbers and size, and assessment of fish condition at release. ("benefits" and "risks" – the "risks" refers to risk aversion measure of releasing fall chum after April 1 to protect summer chum from competition and behavior modification effects.)
Disease Control	11) Hatchery practices implemented consistent with the Co-managers' Washington Salmonid Disease Control Policy's procedures. 12) Fish health monitored by fish health professional of the Northwest Indian Fisheries Commission during broodstock capture, juvenile fish incubation and rearing operations. Measures implemented to prevent and treat fish disease as recommended by the fish health professional. 13) Fish released in healthy condition.	11,12 &13) Reports by fish disease professional on fish disease monitoring, including disease incidents and treatments. Certification by fish disease professional of fish health and condition at release. ("benefits" and "risks" – the "risks" associated with protecting listed species from potential disease transfer.)
Natural Fall Chum	14) Stray rates to fall chum streams outside Port Gamble Bay at acceptable rates (to be determined). This performance standard is under consideration and would be implemented only as part of a large-scale effort including other hatchery facilities.	14) Mark otoliths of hatchery fall chum. Then perform spawner surveys, estimate escapement and sample otoliths from returning adults of local streams to identify proportion of hatchery fish in escapement. ("risks")

1.11) Expected size of program.

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish). 1,300 adult fall chum salmon (433 females and 867 males based on observed male to female sex ratio of 2:1.). The egg take goal is 1,200,000 assuming 2,800 eggs per female.

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

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry	Little Boston Creek	950,000
Fingerling		
Yearling		

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data. There are no direct estimates of smolt-to-adult survival. The Co-managers have been using the average estimate of fish returns per pound of fish produced for WDFW's Hoodsport Hatchery (1965-1971, prior to installation of a saltwater acclimation pond) to forecast the Port Gamble hatchery run size (PNPTC and WDFW 1999). The average estimate is 3.462 fish returns per pound of fish produced. When this estimate is applied to the appropriate release parameters (950,000 fry smolts @ 550 fish per pound, see sections 1.9 and 10.3), the results are an adult production level of approximately 6,000 fall chum and a smolt-to-adult survival of 0.009. These estimates are in excess of the minimum goals of 3,000 adults and 0.005 survival described above in section 1.9.

Estimates for the years 1988 through 1998 of the Port Gamble Hatchery fall chum run sizes entering Puget Sound and of the total escapements are provided in the following table. These estimates are from the Puget Sound run reconstruction records compiled by WDFW (accessed 8/18/99).

Year	Puget Sound Run Size /1	Escapement /2
1988	11,969	301
1989	5,536	138
1990	10,307	333
1991	678	141
1992	1,154	90
1993	597	86
1994	3,887	1,512
1995	6,794	2,117

1996	13,593	5,446
1997	7,562	3,366
1998	8,377	5,552

/1 Note that the estimates of run size entering Puget Sound are comprised of assumed catches in Puget Sound (including Port Gamble Bay) and total escapement.
/2 Escapement includes estimates of hatchery returns to Port Gamble Bay tributaries.

1.13) Date program started (years in operation), or is expected to start.
The program began with release of brood 1976 fall chum fry in the spring of 1977 and has been in operation for 24 years.

1.14) Expected duration of program.
No limit on the duration of the program has been set.

1.15) Watersheds targeted by program.
The Port Gamble Hatchery is located on Little Boston Creek (WRIA 15.0350).

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.
The Port Gamble Hatchery is a tribal facility. Location of the hatchery on the Port Gamble S'Klallam Indian Reservation along with expected fall chum adult returns to Port Gamble Bay (providing tribal members with direct and relatively easy access to the fish) were primary considerations for initiating the program. The current site was determined to be the best alternative for an on-reservation facility.

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

2.1) List all ESA permits or authorizations in hand for the hatchery program.
None in hand; ESA listings are new in this area.

2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.
There are no listed species in Little Boston Creek or in other tributaries to Port Gamble Bay. Potential use of the Port Gamble Bay estuary by listed species is unknown but may occur. There are no direct takes of listed species by the program. The possibility of hatchery fall chum interacting with the listed species exists; however, any potential interactions can be minimized with implementation of appropriate risk aversion measures (see below, section 3.5).

2.2.1) Description of ESA-listed salmonid population(s) affected by the program.
Two listed species may be subject to indirect effects from the program. The Hood Canal and Strait of Juan de Fuca summer chum salmon and Puget Sound chinook are listed as threatened species. Both of these species are found in streams of

Hood Canal, but not in the close vicinity of Port Gamble Bay. The closest summer chum streams are Big Beef Creek, and Big and Little Quilcene rivers in central Hood Canal and Chimacum Creek in Admiralty Inlet. The closest stream producing natural chinook is the Dosewallips River in central Hood Canal. It is possible that juvenile or adult summer chum and chinook pass through Port Gamble Bay while migrating to and from the ocean. Detailed descriptions of the listed species, including life histories are contained in the Summer Chum Salmon Conservation Initiative (WDFW and Point No Point Treaty Tribes 2000), the Status Review of Chum Salmon from Washington, Oregon, and California (Johnson et al. 1997) and the Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California (Myers et al. 1998).

- Identify the ESA-listed population(s) that will be directly affected by the program.
None.

- Identify the ESA-listed population(s) that may be incidentally affected by the program.
Puget Sound chinook, originating from Hood Canal, and Hood Canal summer chum may, while migrating to the ocean, enter Port Gamble Bay where interactions with Port Gamble Hatchery fall chum could occur. The Port Gamble Hatchery fall chum program may incidentally affect the listed chinook by providing additional prey for the chinook juveniles and by potentially serving as a vector for disease transfer. The program may incidentally affect the listed summer chum by competition, behavior modification or disease transfer.

Returning adults of the listed species are not likely to be incidentally affected by the program. The earlier run timing of the listed species (August to early October) does not overlap with that of the hatchery fall chum (late October to December). Also, the fall chum release site in Little Boston Creek is relatively far removed from the home streams of the summer chum and chinook. Therefore, interactions between the fishes are not probable and fisheries directed at the later fall chum would not impact the chinook or summer chum.

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.
The Co-managers have recently identified chinook in Hood Canal as falling into two categories. Chinook of the Skokomish, Lilliwaup, Hamma Hamma, Duckabush and Dosewallips rivers are in Category 2, where the existing population is not indigenous but where historical information indicates a sustainable population did at one time exist. These populations are each being managed to recover a locally adapted, naturally sustaining population over the long term. The existing chinook populations in streams of the west Kitsap peninsula are in Category 3, where it has been determined that historically a

sustainable population did not exist. The existing populations are the result of hatchery outplanting or straying and are not being managed as sustainable populations.

The SCSCI provides two assessments of summer chum salmon stock status. The first is a reevaluation of the 1992 Salmon and Steelhead Stock Inventory (SASSI) (WDF et al. 1993). The results of that reevaluation show the status of 16 Hood Canal and Strait of Juan de Fuca stocks distributed as follows: seven extinct, two critical, five depressed, one healthy and one unknown. The second assessment considers stock extinction risk following a procedure described by Allendorf et al. (1997); its results showed the nine existing stocks' current status to be distributed as follows: four at low risk, two at moderate risk, two at high risk, and one of special concern.

- 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.
Not applicable. The Port Gamble Hatchery does not produce a listed species. There are no direct effects on any specific listed population(s) by the Port Gamble Hatchery fall chum 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.
Not applicable.

- 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.
Not applicable.

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.
There is no direct take of listed species. The release of fall chum from Port Gamble Hatchery may lead to interactions with listed species associated with competition, behavioral modification and disease transfer. See below section 3.5.

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

There is no direct take and no information exists upon which to base quantified estimates of possible indirect take. The risk of indirect take is low. Table 1 is not applicable.

- 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).
There appears to be low risk of any take (see above and section 3.5).

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.
This program is fully consistent with the guidelines, protocols, and implementation of the Co-manager's Summer Chum Salmon Conservation Initiative (SCSCI) (WDFW et al. 2000). The applicable part of the SCSCI addressing potential interaction of the summer chum with hatchery fish is section 3.3.

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 all relevant standing orders and agreements. The Puget Sound Salmon Management Plan (PSSMP) 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.

3.3) Relationship to harvest objectives.
The fishery production goal of the Port Gamble Hatchery fall chum program is consistent with the fisheries management objectives and measures defined in section 3.5 of the Summer Chum Salmon Conservation Initiative (WDFW and PNPT Tribes 2000) to protect Hood Canal summer chum. The "base conservation regime" for managing harvest includes no fisheries directed at summer chum. The total incidental fishery harvest rate expected under the Summer Chum Salmon Conservation Initiative is 10.8% (with a range of 3.3% to 15.3%). These rates reflect the incidental fishery harvest levels of all Canadian and U.S. fisheries. Because the Port Gamble Hatchery fall chum has a substantially later run timing than the summer chum, there is no risk of incidentally harvesting summer chum in fisheries directed at the fall chum.

Management measures to protect Puget Sound chinook are being addressed in the Comprehensive Chinook Planning process initiated by the Co-managers and working with the National Marine Fisheries Service's staff. The NMFS issued a Section 7 permit

for the 1999 chinook fishing season. Currently, work is progressing on a Fisheries Management and Evaluation Plan to apply for a take exemption under the 4(d) rule. The Port Gamble Hatchery fall chum program is consistent with current management objectives and practices to protect Puget Sound chinook. As with summer chum, the late run timing of fall chum eliminates the risk of chinook interception during fisheries directed at the fall chum.

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.

The fisheries benefiting from the program primarily include commercial treaty and non-treaty net fisheries. Low levels of sport harvest also occur, though chum salmon are not commonly taken in recreational fisheries. The fall chum harvest in Port Gamble Bay is primarily treaty catch. The following table provides estimates of catches and total harvest rates from 1988 through 1998.

Return Year	Estimated Total Harvest /1	Port Gamble Bay Harvest /2	Total Harvest Rate /3
1988	11,668	3,768	.97
1989	5,398	1,512	.97
1990	9,974	2,195	.97
1991	537	187	.79
1992	1,064	438	.92
1993	511	165	.86
1994	2,375	682	.61
1995	4,677	1,451	.69
1996	8,147	2,817	.60
1997	4,196	253	.55
1998	2,825	24	.34

/1 Based on Puget Sound run reconstruction records compiled by WDFW (accessed on 8/18/99).

/2 Catch records from Microcomputer Historical Catch and Landing Summaries (MHCLS) maintained by NWIFC (accessed 8/3/00).

/3 Harvest rates have been calculated from the Puget Sound run reconstruction records using the following equation:

Harvest Rate = (Total Run – Total Escapement) + Total Run

See table showing total runs and total escapements in section 1.12.

3.4) Relationship to habitat protection and recovery strategies.

The Port Gamble Hatchery fall chum program is not related to any habitat protection and recovery strategies for Hood Canal summer chum salmon or Puget Sound chinook.

3.5) Ecological interactions.

The release of fall chum and their entry into Port Gamble Bay and other estuarine areas may lead to interactions with the listed species. Potential effects on the listed summer chum would be through competition for food and shelter in the estuaries, modification of behavior (including changes in summer chum feeding behavior, in predator avoidance behavior and in use of preferred migration areas), and disease transfer (assuming any infected hatchery fall chum could transfer disease to summer chum in the estuary). Specifically where, when and if such effects may occur is unknown. The potential risk of a take would appear low (see section 3.3 of SCSCI), especially with implementation of the risk aversion measures described below in sections 9.2.10, 10.11 and 11.2.

Fall chum fry released by the program may be subject to predation by listed fall chinook in the estuary and potentially could be a source of disease infection to the chinook. The risk of a listed chinook take appears to be low, particularly given the risk aversion measures taken with respect to disease control (sections 9.2.10, 10.11 and 11.2).

SECTION 4. WATER SOURCE

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

The source of water for the Port Gamble Hatchery fall chum program is Little Boston Creek, a spring fed tributary to Port Gamble Bay. The water is diverted into a pipeline at a concrete dam approximately 0.25 mile upstream of the mouth of the creek. Water flows vary with the season of the year. During the winter and spring, flows are approximately 450 gpm, but then decrease to 200 gpm and lower during the summer. Water temperatures during the hatchery operation are fairly stable, in the 40s Fahrenheit, but may drop to lower temperatures during prolonged winter cold spells and may rise into the 50s during the summer. After passing through the hatchery incubation and rearing facilities, the diverted water is returned to the instream adult collection facility and passes downstream and immediately into the bay. Production at the hatchery is currently limited to fall chum and with a goal of 950,000 fish released at 400 fish per pound (approx. 2,400 lbs) is well below the minimum 20,000 pound annual production level requirement for a National Pollution Discharge Elimination System (NPDES) permit.

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.

Not applicable to listed fish, since none occur in Little Boston Creek.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).
Fall chum broodstock return to the Port Gamble Hatchery through a fish weir at the mouth of Little Boston Creek. The fish enter a concrete adult collection pond measuring 30' x 30' by 3'. Approximately once per week, a seine is used to crowd the fish, so that the fish may be netted, counted and sorted by sex and ripeness. The fish are held temporarily in net cages placed in the pond before being spawned, surplused or retained for later spawning.

5.2) Fish transportation equipment (description of pen, tank truck, or container used).
Not applicable. No fish are transported off station

5.3) Broodstock holding and spawning facilities.
See description under 5.1. Fish are spawned in a covered area directly adjacent to the trap.

5.4) Incubation facilities.
The incubation facilities consist of a shed, covering an area approximately 24' x 20' with 8'ceiling, in which 12 vertical stacks of 16 Heath-Techna trays are housed. A branch pipe from the main water supply provides water flow to the eggs. Sediments are removed from the water by an inclined plate gravity separator filter system. Egg capacity is 1.5 million eggs.

5.5) Rearing facilities.
Rearing facilities include six concrete raceways (each 40' x 4' x 1.5') and three fiberglass circular ponds (13' diameter x 4'high). The majority of rearing takes place in the raceways. The circular ponds are used to reduce the density of fish, should water supply become limited and there is indication of potential stress from increased fish loading (see section 9.2.2).

5.6) Acclimation/release facilities.
Fry are released on station. Immediately prior to release (same day), fry are moved to and held in the adult collection pond.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.
In past years, heavy sediments loads have caused fish losses at the incubation stage. However, the current use of a sediment filter system appears to have solved the problem (see section 9.1.1).

Also, in the past, efforts to increase production (i.e., at various times using pink, chinook, coho and fall chum) have resulted in higher than desired pond loadings, losses of fish and early fish releases. The pond loading has been effectively managed at the current production level.

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.

Listed fish are not expected to be directly and negatively affected by hatchery failure since there are no listed fish in Little Boston Creek or the hatchery.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

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

6.1) Source.

The current source is Finch Creek stock. A fall chum run to Little Boston Creek has been established and now serves as the operational broodstock.

6.2) Supporting information.

6.2.1) History.

When hatchery operations began (brood year 1976 released in 1977), the source of broodstock was Walcott Slough fall chum obtained through the USFWS. This source continued through brood year 1978 (released in 1979), the transition year to a new broodstock source from Finch Creek. From brood year 1978 through brood year 1993, eggs of Finch Creek stock were obtained each year from WDFW's southwest Hood Canal hatcheries and generally were responsible for the majority of fall chum production. However, beginning with brood year 1994, adult returns to Little Boston Creek have been the sole source of the hatchery's eggs. The final transition took place over the course of approximately ten years.

6.2.2) Annual size.

Hatchery returns are assumed to have been the only broodstock source. Recent hatchery broodstock returns (1994-1999) have annually averaged 3,150 with a male to female sex ration of 2:1. The range of annual returns to the hatchery in the same period has been 930 to 5,550.

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

No historic records exist of natural fall chum in Little Boston Creek. The assumption is that there has been little to no incorporation of natural fall chum into the broodstock.

6.2.4) Genetic or ecological differences.

No natural fall chum stock exists in Little Boston Creek.

6.2.5) Reasons for choosing.

The Finch Creek broodstock was chosen because of its availability and because it is also the source for the vast majority of Hood Canal hatchery production (from WDFW hatcheries) in support of fisheries.

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.
No listed natural fish are affected by the broodstock selection practices and no risk aversion measures are necessary.

SECTION 7. BROODSTOCK COLLECTION

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

7.2) Collection or sampling design.
Fall chum are collected in November and December at the hatchery facilities. The facilities include a fish weir, through which the returning adults voluntarily pass, and an adult holding pond. At least once a week, the fish are subject to collection for spawning and possibly to be surplused. A seine is used to crowd the fish so that they may be captured and sorted. The sorted fish are temporarily held in portable cages placed in the holding pond. Then fish are removed to be spawned or surplused. Some fish not yet ripe may be retained in the pond until the next collection. The collections are spread throughout the period of returning fish. Timing and amount of spawning throughout the collection period are representative of the spawning goal and historical timing

7.3) Identity.
One population of hatchery fall chum is present during the collection period.

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):
Recent records, since Port Gamble Hatchery returns have become the sole broodstock source, show a male to female ratio of 2:1. Therefore the broodstocking goal is 1,300 spawners, 867 male and 433 female.

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available: Note that Finch Creek stock eggs were imported through 1993 as shown in following table. All adult broodstock collection levels shown apply to Port Gamble Hatchery returns only.

Brood Year	Adults /1 Females	Males	Jacks	Eggs /2	Juveniles
1988	179	125		2,000,000	
1989	82	37		2,000,000	
1990	227	76		2,000,000	
1991	66	40		2,000,000	

Brood Year	Adults /1 Females	Males	Jacks	Eggs /2	Juveniles
1992	44	42		2,000,000	
1993	12	13		2,010,000	
1994	602	602			
1995	494	504			
1996	754	755			
1997	488	488			
1998	540	540			
1999	210	210			

/1 Includes only adults taken for broodstocking from returns to Port Gamble Hatchery.
/2 Eggs imported from WDFW hatcheries in Hood Canal.

(Link to appended Excel spreadsheet using this structure. Include hyperlink to main database)

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.
The goal of broodstock collection is to take only enough spawners to meet fish production needs. Surplus fish and carcasses are disposed of by distributing to tribal members for personal use, then distributing to non-tribal people for personal use and, as a last resort, burying the fish at a dumpsite removed from any streams on the Tribe's reservation.

7.6) Fish transportation and holding methods.
No live fish are transported away from the hatchery. Adult fish may be held in the adult pond or circular ponds for brief periods until ripe or until provisions for surplusing can be arranged.

7.7) Describe fish health maintenance and sanitation procedures applied.
Professional fish pathologists of the NWIFC Fish Health Services program perform the fish health monitoring associated with adult fish collected during broodstocking. Regulated pathogens are screened by sampling fish at the time of spawning in accordance with procedures set forth in the Co-Managers of Washington Salmonid Disease Control Policy (NWIFC and WDFW 1998). Ovarian fluid, kidney, and spleen samples are collected from all fish spawned for evaluation and testing by the pathologists for disease certification purposes.

7.8) Disposition of carcasses.
See 7.5 above.

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.
Broodstock collection for the Port Gamble Hatchery fall chum program does not have any adverse genetic or ecological effects on listed natural fish and no risk aversion measures are necessary. The risk of fish disease amplification is minimized by following the Co-manager's Salmonid Disease Control Policy guidelines for sanitation, fish health maintenance and monitoring.

SECTION 8. MATING

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

8.1) Selection method.
Spawners are collected as the fish arrive in the pond, proportional to the timing, weekly abundance, and duration of the total return. There is one to several spawning days each week depending on the number of returns (and the corresponding timing and associated abundance of the run). Each spawning day, spawners are collected as non-biased (i.e., with respect to size and appearance of fish) samples of the available population of ripe fish. Fish in excess of spawning needs are surplused.

8.2) Males.
Backup males are retained in the event that one or more males are not ripe or spawned out and a replacement or replacements are needed. The spawning ratio objective of one male to one female is not changed.

8.3) Fertilization.
The fall chum are spawned in a covered area adjacent to the holding pond. Three females are spawned into a bucket followed by three males. The eggs and milt are then mixed. The eggs are subject to one-hour immersion in an iodophor solution (during water hardening) as a disease prevention measure before being placed in incubation trays.

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.
The mating of the hatchery fall chum will not have adverse genetic or ecological effects on any natural listed species and therefore no risk aversions measures are necessary to protect them. Unbiased selection of fish throughout the run and mating at a sex ratio of 1:1 are measures taken to reduce the risk of losing within population genetic diversity of the fall chum.

SECTION 9. INCUBATION AND REARING -

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

9.1) Incubation:

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

Estimates of egg takes and resulting fry ponded, from broodstock returning to Port Gamble Hatchery, are shown in the following table for the years 1988-1999. Also shown are the calculated survival rates from egg take to ponding (survival rate = fry ponded + egg take).

Brood Year	Estimated Egg Take (nearest 100)	Estimated Fry Ponded (nearest 100)	Survival Rate
1988	440,000	402,600	.91
1989	257,800	164,000	.64
1990	653,900	599,900	.92
1991	145,000	116,400	.81
1992	108,000	80,000	.74
1993	36,000	30,000	.83
1994	1,670,500	1,151,100	.69
1995	1,145,000	602,100	.53
1996	1,562,700	1,052,500	.67
1997	1,130,800	532,000	.47
1998	1,353,400	906,300	.67
1999	630,500	538,900	.85

The variation in survival rates shown in the table is the result of a problem with sedimentation over the years. The severity of the problem has varied depending in large part on the annual amount of high flow incidents in Little Boston Creek, the hatchery water source, and also on the success of efforts to solve the problem.

Incubation initially occurred only in the raceways with the eggs placed on large trays (Netarts style). Prior to 1995, in some years, eggs were also incubated in trays placed in the circular ponds or the adult rearing pond. An incubation building, containing Heath tray stacks was constructed and first used in 1995; its use continues to the present time.

In 1998, a new sediment filter system was installed in the incubation building. Unfortunately, the incubation water supply was blocked by sediments in the pipe leading to the filter during the first (break-in) year of operating the filter system. As a result, in that year there were higher than expected egg mortalities. The water supply line was re-plumbed to eliminate potential future sediment accumulation and blocking of the water supply pipeline. The survival rate in the following year (1999) was relatively high at .85 and the hatchery crew is now confident that the sediment problem is under control.

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

None anticipated. Egg take goals have been set based on experience with survival of eggs and fish in the hatchery. No significant surpluses are expected.

9.1.3) Loading densities applied during incubation.
Approximately 5,000 to 10,000 eggs are loaded per Heath tray (from three female spawners). Flow rate per 16 tray stack is 3-5 gpm. Sediments are controlled by use of an inclined plate gravity separator filter system.

9.1.4) Incubation conditions.
The eggs are incubated in a dark building and are not disturbed during the tender stage before the eggs become eyed. Folded, plastic vexar pads are used as artificial substrates in the trays. The eggs are monitored for any possible sediment build-up and the sediment filter is changed as often as needed to control sediments in the water. Water temperatures have been found to be stable in the lower to mid 40s Fahrenheit, occasionally falling lower during extreme cold spells. Freezing is not a problem. In the event of heavy sediment build-up or perceived higher than normal mortalities, dissolved oxygen is monitored at the flow outlets to the tray stacks. General incubation operating conditions are monitored, as is the progress in egg development, egg hatching and absorption of yolk sacs by fry ("buttoning–up").

9.1.5) Ponding.
Fry are transferred from the incubation trays to the raceways after greater than 90% have absorbed their yolk sacs, usually in the first week of March. The fry are non-volitionally transferred through pipes to the raceways (no direct handling).

9.1.6) Fish health maintenance and monitoring.
All fall chum are incubated under the guidance of certified fish health personnel from NWIFC and in accordance with the Co-Manager's Salmonid Disease Control Policy (NWIFC and WDFW 2000). All eggs are water hardened for one hour in an iodophore solution before being placed in incubation trays. Fungus in incubators is controlled by formalin drip (three times per week) prior to eye-up. Eggs are shocked at eye-up and dead eggs (mortalities) are removed.

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.
No adverse genetic or ecological effects on listed species are anticipated from incubation of the fall chum. Implementation of the above-described measures to control sedimentation and disease is expected to minimize risk of fall chum egg loss.

9.2) <u>Rearing</u>:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available.
The following survival rate estimates apply only to broodstock from returns to Port Gamble Hatchery.

Brood Year	Survival Rate Egg Take to Ponding /1	Survival Rate Ponding to Release /2	Survival Rate Egg Take to Release /3
1988	.91	.99	.90
1989	.64	.88	.56
1990	.92	.77	.71
1991	.81	.99	.80
1992	.74	.99	.73
1993	.83	.99	.82
1994	.69	.98	.68
1995	.53	.99	.52
1996	.67	.99	.66
1997	.47	.99	.47
1998	.67	.99	.66
1999	.85	.98	.83

/1 Estimated survival rate is calculated as estimated fry release divided by estimated egg take. See also table in section 9.1.
/2 Estimated survival rate is calculated as estimated fry release divided by estimated fry ponded.
/3 Estimated survival rate is calculated as estimated fry release divide by estimated egg take.

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

The limited available water flows to the facility is the primary fish loading constraint. Generally recommended flow-based maximum loading limits may be exceeded during rearing. This is addressed by closely monitoring dissolved oxygen at the outflow of the rearing vessels. When and if dissolved oxygen levels approach 8-9 ppm or if fish show signs of stress, the fish density of the vessel(s) is reduced by moving fish from the raceways to the circular ponds. This approach of reducing fish densities at higher flow-based loads has been successful as indicated by low disease incidence and the general good health and condition of the fry at release. Feeding technique may be a factor regarding the fish loads accommodated at this facility. Hand feeding at a high daily rate (approximately half hour intervals during daylight hours) appears to result in a high percent of feed being taken by fish, with less accumulation of wasted food on the bottom of rearing vessels, and thus may lower biological oxygen demand.

9.2.3) Fish rearing conditions

The fish are monitored daily for mortalities, aberrations in behavior and morphological changes that may indicate stress, disease or possible other negative impacts. Any problems are addressed immediately. Weight samples to estimate fish size are collected approximately every 1.5 weeks or 4 to 5 times during the rearing season. The fish are watched closely as loading increases and dissolved oxygen is monitored at rearing vessel outflows. Actions are taken as necessary to address increased loading as described above in section 9.2.2.

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. Weight samples are taken every 1.5 weeks, measuring fish per pound (fpp); however, records have not been kept. Generally, the fry are ponded in early March and are reared until release in late April. Over an approximate one and a half month period, the fry grow from approximately 1,250 fpp to approximately 550 fpp.

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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.

Feeding of fish begins after ponding using starter mash followed by starter pellets (semi-moist) for approximately two to three weeks. Then fish are fed 1 mm moist feed pellets until release. The feeding rate is 1.5 % body weight per day for starter mash and starter pellets and 3% per day for 1 mm pellets. The fish are hand fed approximately every half hour during daylight hours. Direct estimates of food conversion efficiency are not possible because applicable historical data records have not been kept.

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

Fall chum are reared under the guidance of certified fish health personnel from NWIFC and in accordance with the Co-Manager's Salmonid Disease Control Policy (NWIFC and WDFW 1998). Fish are monitored daily by the hatchery crew for signs of disease by observing feeding and swimming behavior, daily mortality trends and general fish appearance. A fish disease professional checks the fish after ponding, just prior to release, and at any time the hatchery crew detects any disease or unaccountable stress and requests assistance. Potential stress from pond loading is addressed as described above in section 9.2.2.

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

Not applicable.

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

None.

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

No adverse genetic or ecological effects on listed species are anticipated from rearing of the fall chum. Disease prevention and treatment measures (section 9.2.7) are taken to minimize risk of fish disease transfer to listed species of Hood Canal summer chum and

Puget Sound chinook.

SECTION 10. RELEASE

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

10.1) Proposed fish release levels.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry	950,000	400-450	April - May	Little Boston Creek
Fingerling				
Yearling				

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

Stream, river, or watercourse: Little Boston Creek, WRIA 15.0350
Release point: Port Gamble Hatchery adult holding pond at stream mouth
Major watershed: Port Gamble Bay
Basin or Region: Hood Canal

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

The following table shows total Port Gamble Hatchery release of fall chum from 1988 through 1999. Broodstock sources of fry include eggs imported from WDFW Hood Canal hatcheries and eggs collected from Port Gamble Hatchery adult returns for release years 1988 through 1994. Port Gamble Hatchery adult returns were the only broodstock source for release years 1995 through 1999.

Release year	Eggs/ Unfed Fry	Avg size	Fry (nearest 10K)	Avg size (fish/lb)	Fingerling	Avg size	Yearling	Avg size
1988			1.70 million	570-800				
1989			2.30 million	350-890				
1990			1.10 million	150-500				
1991			0.46 million	370-530				
1992			1.40 million	270-1,000				
1993			1.95 million	200-1,300				

Release year	Eggs/ Unfed Fry	Avg size	Fry (nearest 10K)	Avg size (fish/lb)	Fingerling	Avg size	Yearling	Avg size
1994			1.76 million	400-860				
1995			1.13 million	400-930				
1996			0.60 million	550				
1997			1.05 million	800				
1998			0.53 million	240-850				
1999			0.90 million	550				
Average			1.24 million	540 (based on total annual lbs)				

The above table shows production has varied over the years. There have been attempts to increase production (before 1995) and fry have been released over a range of sizes (fed and unfed fry, ranging from 150 to 1,300 fish per pound). Production levels have also been affected by fish losses owing primarily to accumulation of sediments on eggs during incubation, but also associated with heavy fish loading in some years. Attempts to culture other species (chinook, coho and pink salmon) at various times and the use of net pens to rear fry in Port Gamble Bay (in earliest years) have also affected fall chum production and size at release. Average size of fall chum at release calculated as the fry number divided by fry weight results in an estimate over the years of 540 fish per pound. This average plus experience of the hatchery crew suggests that the size at release goal should be changed from 400 to 550 fish per pound.

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

Ranges of release dates for a recent five years are as follows:

1995 4/2-5/15
1996 4/23
1997 4/23
1998 4/30
1999 4/29

Fall chum are released at size(s) as close to goal as possible in April/May before water flows diminish. Fall chum are force released (non-volitional) on selected dates. Release dates are selected when there is a high tide in the evening, to encourage rapid fry exodus and minimize loss of fry by predation.

10.5) Fish transportation procedures, if applicable.
Not applicable.

10.6) Acclimation procedures
Acclimation is in hatchery. Fish are released from Port Gamble Hatchery directly into Little Boston Creek .

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.
No marks.

10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.
None anticipated. All fish on hand will be released after April 1.

10.9) Fish health certification procedures applied pre-release.
Fall chum fry are examined by NWIFC fish pathologist prior to release.

10.10) Emergency release procedures in response to flooding or water system failure.
Every attempt will be made to avoid early release of fish but in the event of an emergency, the fish at buttoned-up stage or later may be released directly into Little Boston Creek to avoid or minimize fish losses.

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.
Fall chum fry are released after April 1 to reduce risk of potential interactions (competition and behavior modification) with Hood Canal summer chum. Disease prevention and treatment measures are taken to minimize risk of fish disease transfer to the listed species of Hood Canal summer chum and Puget Sound chinook.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

11.1.1) Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.
Record keeping practices to meet monitoring requirements, described under "Performance Indicators" in Section 1.10, are being reviewed. Monitoring procedures and record keeping will be improved or added where appropriate.

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

Currently available funding, staffing, and support logistics are expected to be adequate to meet the monitoring and evaluation requirements described under "Performance Indicators" in section 1.10, except additional funds would be required to support any fall chum otolith marking, mark recovery and analysis.

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 the monitoring and record keeping described in section 1.10 will contribute to the minimum likelihood of any genetic and ecological effects on listed fish. In this regard, records of particular value will be dates of fish release (to verify fall chum releases after April 1 in order to avoid interactions with summer chum in the estuary) and the reports of fish disease testing and certification (to minimize the risk of fish disease transfer to listed species).

SECTION 12. RESEARCH

Not applicable to this program.

12.1) Objective or purpose.
Not applicable

12.2) Cooperating and funding agencies.
Not applicable

12.3) Principle investigator or project supervisor and staff.
Not applicable

12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.
Not applicable

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.
Not applicable

12.6) Dates or time period in which research activity occurs.
Not applicable

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.
Not applicable

12.8) Expected type and effects of take and potential for injury or mortality.
Not applicable

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).
Not applicable

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.
Not applicable

SECTION 13. ATTACHMENTS AND CITATIONS

Allendorf, F.W., D. Bayles, D.L. Bottom, K.P. Currens, C.A. Frissell, D. Hankin, J.A. Lichatowich, W. Nehlsen, P.C. Troter, and T.H. Williams. 1997. Prioritizing Pacific salmon stocks for conservation. Conservation Biology Vol. 11 No. 1 p. 140-152.

Johnson, O.W., W.S. Grant, R.G. Kope, K. Neely, F.W. Waknitz and R.S. Waples. 1997. Status Review of Chum Salmon from Washington, Oregon, and California. NOAA Technical Memorandum NMFS-NWFSC-32. 255 p., plus Appendix.

Myers, J.M., R.G. Kope, G. J. Bryant, D. Teel, L.J. Lierheimer, T.C. Wainwright, W.S. Grant, F.W. Waknitz, K. Neely, S.T. Lindley and R.S. Waples. 1998. NOAA Technical Memorandum NMFS-NWFSC-35. 443 p.

Northwest Indian Fisheries Commission and Washington Department of Fish and Wildlife. 1998. Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State. Revision effective March 17, 1998. 22 p.

Point No Point Treaty Council and Washington Department of Fish and Wildlife. 1999. 1999 Management Framework Plan and Salmon Run's Status for the Hood Canal Region. 38 p.

Washington Department of Fisheries, Washington Department of Wildlife, and Western Washington Treaty Indian Tribes. 1993. 1992 Washington State Salmon and Steelhead Stock Inventory. Olympia. 212 p.

Washington Department of Fish and Wildlife and Point-No-Point Treaty Tribes. 2000. Summer Chum Salmon Conservation Initiative. An Implementation Plan to Recover Summer Chum salmon in the Hood Canal and Strait of Juan de Fuca. Jim Ames, Gary Graves, Chris Weller editors. 424 p., plus 3 Appendices.

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:
Chris Weller, Fish Biologist, Point No Point Treaty Council

Certified by_____ Date

NOT APPLICABLE. Risk of take is very low and no reasonable quantified estimates of take can be made. See section 2.2.3.

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

Listed species affected: Summer chum salmon ESU/Population: Hood Canal Summer Chum ESU / Union River Activity: Supplementation				
Location of hatchery activity: George Adams Hatchery / Union River trap/ Huson Spring facility Dates of activity: August -May Hatchery program operator: WDFW, Hood Canal Salmon Enhancement Group				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)				
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

Instructions:

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