HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Baker Lake Sockeye Program
Species or Hatchery Stock:	Baker Lake Sockeye
Agency/Operator:	Washington Department of Fish and Wildlife
Watershed and Region:	Skagit River North Puget Sound
Date Submitted:	March 17, 2003
Date Last Updated:	March 25,2003

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Baker Lake Sockeye Spawning Beaches

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

Sockeye Salmon (*Onchorhynchus nerka)* – not listed

1.3) Responsible organization and individuals

Indicate lead contact and on-site operations staff lead.

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

Puget Sound Energy: Provides funding for the program as mitigation for two hydropower dams on the Baker River.

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

Puget Sound Energy (PSE) provides full funding for the hatchery program as mitigation for two hydropower dams on the Baker River. PSE also provides funding which supports a WDFW pathologists' time involved with the program.

The facility is staffed by one full-time WDFW employee whose time is paid for by PSE. Additional assistance comes from the hatchery complex staff as well as PSE staff.

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

The Baker Lake Sockeye Spawning Beach facilities are located on the Baker River, a Skagit River tributary (WRIA 3 & 4), located in Washington State. They are owned by Puget Sound Energy (PSE) as mitigation for two dams on the Baker River and operated by the Washington Department of Fish and Wildlife. The facilities consists of an adult trap at River Mile (RM) 0.5 , four artificial spawning beaches along Baker Lake and Shannon Lake and a facility infrastructure which supports the program.

Spawning beaches number 1, 2 and 3 are located on spring fed Channel Creek at the upper end of Baker Lake at RM 19.2. Spawning beach #4 is located at the mouth of Sulfur Creek, a spring fed creek, just below the Baker Dam and at the very head end of Lake Shannon (RM 9).

1.6) Type of program.

Integrated Harvest and Research

1.7) Purpose (Goal) of program.

This is a mitigation program to replace spawning habitat lost as a result of hydroelectric power development on the Baker River. The mitigation goal of this program is to maintain an adult return level of 3,000 fish and to prevent the extirpation of this unique stock by providing suitable semi-natural spawning/incubation opportunity via man-made spawning channels or other fish cultural methods.

1.8) Justification for the program.

This program operates to mitigate for spawning habitat loss and minimizes the potential extirpation of this stock by providing man-made propagation alternatives for this stock.

1.9) List of program "Performance Standards".

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

Performance Standards and Indicators for Puget Sound **Integrated Harvest** sockeye programs.

Performance Standard	Performance Indicator	Monitoring and Evaluation Plan
Produce adult fish for harvest	Survival and contribution rates	Monitor catch and measure survivals by periodical age composition analysis.
Meet hatchery production goals	Number of juvenile fish released – **See section 1.11.2**	Estimating number of fish planted (weighing / counting fish), monitoring proximity to hatchery production goals, number released recorded on hatchery divisions "plant reports", data available on WDFW data base. Future Brood Documents.

Manage for adequate escapement	Hatchery and wild return rates Catch rates	Monitoring hatchery/wild return rates through trapping at the hatchery trap.
Minimize interactions with listed fish through proper broodstock management.	Total number of broodstock collected – **goal is to place 3000 adults onto the spawning beaches**	Measuring number of fish actually spawned and killed to meet egg take goal at the hatchery. Hatchery Records. Hatchery Records Start trapping prior to historical start of the run, continue trapping throughout the run, dates and times are recorded on hatchery divisions "adult reports", data available on WDFW data base. Hatchery records Hatchery records Hatchery records Spawning guidelines
	Sex ratios	
	Timing of adult collection – **end of June to the end of August**	
	Number of listed fish returned to the river. – **Unknown**	
	Hatchery stray rate	
	Number wild fish used in broodstock – **Unknown**	
	Return timing of hatchery / wild adults – **end of June to end of August**	
	Adherence to spawning guidelines	

Minimize interactions with listed fish through proper release strategies	Juveniles released as unfed fry – **see section 1.11.2**	Future Brood Document (FBD) and hatchery records Hatchery records and historical natural out-migrant data FBD and hatchery records CWT data and mark / unmarked ratios of adults
	Outmigration timing of listed fish / hatchery fish - **/ mid-February to May**	
	Size and time of release – **from February to May/2400 – 3500 fpp**	
	Hatchery stray rates	
Maintain stock integrity and genetic diversity	Effective population size	Spawning guidelines Spawning ground surveys (if wild spawners)
	Hatchery-Origin Recruit spawners	
Maximize in-hatchery survival of broodstock and their progeny; and Limit the impact of pathogens associated with hatchery stocks, on listed fish	Fish pathologists will monitor the health of hatchery stocks on a monthly basis and recommend preventative actions / strategies to maintain fish health	Co-Managers Disease Policy Fish Health monitoring records
	Fish pathologists will diagnose fish health problems and minimize their impact	
	Vaccines will be administered when appropriate to protect fish health	
	A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings	

	Fish health staff will present workshops on fish health issues to provide continuing education to hatchery staff.	

1.11) Expected size of program.

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

The program goal is to place 3,000 adults onto the spawning beaches.

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

(*Use standardized life stage definitions by species presented in* Attachment 2).

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry	Baker Lake/Lk Shannon	1,000,000
Fry		
Fingerling	Baker Lake	120,000
Yearling	Baker Lake	5,000

- The numbers above in the table are to be artificially incubated and released (500,000 in 2002). The artificial spawning beaches can produce over 2 million fry at current loading levels. All fish are captured as post-emergent fry and released into Baker Lake to rear naturally.

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

Since 1988, the ratio of eggs deposited : fry out migrating from the beaches has averaged 54.3% with a range of 10 % to 93%. The low years were generally due to IHN-V outbreaks.

Baker River Sockeye Spawning Beach Production, 1957 through 1998 Brood Year

Brood Year	Beach Number	Females Spawned	Egg Production*	Percent Survival	Fry Production
1980	3	269	807,000	58	466,515
1981	2	129	387,000	67	258,000
1982	2	197	591,000	95	561,550
1982	3	674	2,022,000	56	1,129,930
1983	2	412	1,236,000	71	883,120
1984	3	206	618,000	83	511,580
1985	2	48	144,000	70	100,200
1986	3	347	1,041,000	68	707,836
1987	2	307	921,000	67	614,024
1988	3?	455	1,365,000	51	702,727
1989	2	291	873,000	50	433,600
1990	2	598	1,794,000	25	451,804
1990	4	329	987,000	10	95,065
1991	3	172	516,000	93	479,964
1991	4	44	132,000	14	18,203
1992	2	572	1,716,000	24	410,995
1992	3	248	744,000	80	593,581
1992	4	488	1,464,000	68	997,432
1993	3	399	1,197,000	67	798,313
1993	4	1,473	4,419,000	65	2,860,030
1994	2	431	1,293,000	74	953,460
1994	3	414	1,242,000	91	1,127,593
1994	4	764	2,292,000	69	1,575,715
1995	3	350	1,050,000	**	no counts
1995	4	676	2,028,000	50	1,012,656
1996	3	409	1,227,000	**	no counts
1996	4	1,668	5,004,000	45	2,241,883
1997	3	363	1,089,000	**	no counts
1997	4	1,053	3,159,000	61	1,928,621
1998	4	1,156	3,468,000	40	1,383,578

Source: Puget fish rearing records

* Fecundity estimate of 3,000 eggs/female

** IHNV detection in 1996, 1997, 1998 and newly adopted agencies' disease management criteria resulted in the early termination of the program and destruction of fry, which is reflected in lower survival numbers

Since 1988, returns to the Baker Trap have averaged 5,447 adults with a range between 480 to 15,991 adults. Average survival of out-migrant smolts to adults have ranged from 6% to 11%. In general, the overall survival to adulthood is difficult to calculate due to the wide range of smolt out-migration ages and the wide range of adult ages at return. Baker River Sockeye return as 2 through 9 year olds. They stay 1 to 5 winters in freshwater and 1 to 3 winters in marine waters. "Historically" they mostly migrated as 1+ smolts and returned primarily as 4 year old fish. Age data is available since 1991 and some age data was collected 1939-1941.

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

Spawning beach #1 was first used in 1957. Beach #2 was completed in 1959 and beach #3 was completed in 1966. Beach #4 was first used for the 1990 brood sockeye. Beach #4 was built in response to water flow limitations and structural problems at beaches #1, 2, and 3.

1.14) Expected duration of program.

This program is ongoing and is expected to continue long-term.

1.15) Watersheds targeted by program.

The Baker River, tributary to the Skagit River, WRIA 3 & 4.

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

Beginning with the 2002 broodstock returns, a portion (500,000 eggs) of the production were produced using vertical incubators. This was considered due to an anticipated small adult return, historic IHN-virus outbreaks, the need to maintain better disease control and the need to maximize the survival potential to swim-up of Baker Lake sockeye fry.

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

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

None

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.

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

Lower Skagit/MS Trib Fall Chinook

One fall chinook stock exists in the Skagit, spawning in the lower mainstem and in Baker River, Finney Creek and Day Creek. Fall chinook spawning begins in the second week of September, peaks in early October and continues through October.

Suiattle Spring Chinook, Upper Cascade Spring Chinook, Upper Sauk Spring Chinook, Lower Sauk Summer Chinook, Upper Skagit Summer Chinook and Bull Trout/Dolly Varden.

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 (*see definitions in "Attachment 1")*.

Critical and viable population thresholds under ESA have not been determined, however, the SASSI report (WDFW) determined this population (lower Skagit Fall Chinook) to be "depressed".

- 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.
No tag returns at this time to assess survivals.

- 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.

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

* at 4,500 eggs/female

Source: WDFW trapping data

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

NA

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.

Sockeye broodstock collection has a "low" potential to take listed wild Skagit chinook salmon and/or Bull Trout through migrational delay, capture, handling, and release during trap operation at the Baker River trap between the end of June and the end of August. Trapping and handling devices and methods may lead to injury to listed fish during migration through de-scaling, delayed migration and /or delayed mortality as a result of injury or increased susceptibility to predation. All unmarked chinook trapped up to August 15th will be transported into Baker Lake and those trapped from then until the end of August will be returned to the Skagit River. All CWT chinook will have their tags extracted and read at the trap.

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

Unknown

-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).

Unknown

- **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.**

None expected.

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.

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

Puget Sound Energy:

Skagit System (Tribal) Cooperative:

United States Forest Service:

Puget Sound Management Plan (1985)

3.3) Relationship to harvest objectives.

3.3.1) Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

Adults in excess of the 3,000 fish spawner goal may be distributed to the Skagit System Tribal Cooperative for ceremonial and subsistence uses via the trap and/or tribal net harvest.

An in-river recreational harvest may be allowed if surplus adults are available. The tribal commercial and ceremonial/subsistence fishery has averaged 367 fish annually between 1988 and 1999. The range has been from 26 fish to 2,145 fish.

Incidental harvest may occur elsewhere.

3.4) Relationship to habitat protection and recovery strategies.

This program replaces spawning habitat lost due to the construction of two hydroelectric dams on the Baker River. The spawning beaches were designed to replace spawning habitat destroyed by the impoundments. In addition, returning adult salmonids no longer have free access into the upper watershed without human intervention via trapping and hauling.

3.5) Ecological interactions.

Excess Marblemount Hatchery Spring Chinook were planted into Baker Lake in an effort to test this stock for introduction into the system as well as a source of nutrients to the system. When sockeye fry are planted into Baker Lake the hatchery crew notices chinook fingerlings feeding upon the sockeye fry. Hook and line sampling of the fish in the vicinity of the release confirm the presence of and predation by chinook.
The presence of sockeye fry in the Baker system may have a positive effect on chinook, coho and Dolly Varden which are all found in the system.

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.

Spawning beaches number 1, 2 and 3 are on spring fed Channel Creek at the upper end of Baker Lake. Beach #3 utilizes between 1.5 to 2 cfs of water and is the only operational beach at the site. The water quantity and temperature (30's to 50's) is subject to rapid fluctuations and has been a concern the past few years. Beaches #1 and #2 never worked very well and are in disrepair. The site is on U.S. Forest Service property and is ~10 acres. The Baker River has been unstable and has posed a flooding risk to beaches 1, 2, & 3. Consequently, spawning beach #4 was built at the mouth of Sulfur Creek just below the Baker Lake Dam. Beach #4 water is a stable 47 degrees and the beach utilizes 10 cfs. The hillside above the spring source has been unstable recently and has been armored with rock to stabilize it. The spring fed intake, on Forest Service property, feeds an aeration tower by gravity, then on to beach #4. Neither site has NPDES permits as no rearing is conducted. The water sources are fish-free springs and are not screened. The similarity between the spawning beach water supplies and the natal water supplies is not well known.

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.

There are no fish, listed or other, in the hatchery water supplies.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Adult sockeye are trapped volitionally from approximately the end of June through the end of August in the adult trap located at RM 0.3 on the Baker River at the outlet of Lake Shannon. The trap is small and there is no ability to segregate returning adults. Adults are transferred into fish tankers via a water-to-water system. They are visually counted in the process. Power crowders are used to transfer the fish. Adults are hauled into either beach #3 (RM 19) or #4 (RM 9) or into Baker Lake to spawn naturally. All other species, with the exception of chinook and hatchery steelhead, are hauled into Baker Lake to spawn naturally. They are crowded by the power crowders, dipped, measured, mark sampled and counted, by hand, into the tank truck. The trapping site is on PSE land and is secure.

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

Adults are transferred into fish tankers via a water-to-water system. They are visually counted in the process. Power crowders are used to transfer the fish. Most sockeye are transferred into the tank truck without handling. Other species are counted, measured and loaded into the tank truck by hand. Adults are hauled into either beach #3 (RM 19) or #4 (RM 9) or into Baker Lake to spawn naturally.

5.3) Broodstock holding and spawning facilities.

Adult sockeye are held in either beach #3 (RM 19) or #4 (RM 9) until they spawn and die. The pond is not covered and sprinklers are not used. A maximum of 550 spawners are placed into beach #3 and up to 3,000 may be placed in #4.

5.4) Incubation facilities.

A vertical incubation facility was set up (2002 BY) and incubated/isolated 500,000 sockeye eggs. The vertical incubation goal is 1,000,000 eggs.

5.5) Rearing facilities.

None.

5.6) Acclimation/release facilities.

All fry produced at beach #3 are volitionally released into Baker Lake via the spawning beach outlet and creek. Fry from beach #4 are captured as they exit the beach, enumerated and hauled to several release sites in Baker Lake. They are directly released into the lake to rear naturally. The resultant fry from the vertical incubators will be planted in either Baker Lake and/or Lake Shannon.

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

IHN-virus is the chief cause of significant loss in the past. An earth slide into the water supply at beach #4 has caused mortality in the past.

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.

All unmarked chinook trapped up to August 15th will be transported into Baker Lake, and those trapped from then until the end of August will be returned to the Skagit River. All CWT chinook will have their tags extracted and read at the trap. The unmarked fish will be handled and loaded (with rubber fish tubes, water-to-water or with nets) and returned to the river as gently as possible to minimize stress and injury. Dolly Varden ("Bull Trout") will be handled in a similar manner but will be released into Baker Lake.

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 Baker Lake sockeye program utilized indigenous sockeye.

6.2) Supporting information.

6.2.1) History.

This stock was derived primarily from wild Baker River sockeye collected in the Baker River trap after Dam construction was begun in 1924. In 1931, 955,000 sockeye from Yes Bay, Alaska were introduced. In 1959 and 1987-93, a total of 551,000 sockeye via Issaquah Creek were introduced. (It should be noted that Lake Washington sockeye originated, in part, from Baker Lake). Kokanee of Lake Whatcom stock have been planted intermittently. The stock is now maintained entirely (99%+) from semi-natural-origin spawning beach recruits and ($\leq$1%) wild-origin (excess adults spawning naturally above Baker Lake) recruits returning to the Baker River Trap.

In 1913, a survey identified sockeye as spawning primarily in the Baker River, above the historic Baker Lake. Surveys in 1954 and 1955 identified 99% of the Baker River sockeye as spawning on the shores of Baker Lake. Whether the original population had two distinct genotypes, a lake spawning race and a river spawning race, is not clearly known.

6.2.2) Annual size.

The broodstock is essentially 100% artificial spawning beach recruits. 3,000 adults are required for the program needs and they are not sexed prior to placement into the spawning beaches.

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

The program was founded on the natural stock but has been maintained 100% since that time with Baker River trap returns. There is an unknown level of natural fish in broodstock.

6.2.4) Genetic or ecological differences.

See section 6.2.1, paragraph 2

6.2.5) Reasons for choosing.

Local indigenous stock.

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

Listed fish will not be spawned. If they are inadvertently trapped they will be returned quickly and without undue injury back to the river. See section 5.8 above.

SECTION 7. BROODSTOCK COLLECTION

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

Adults

7.2) Collection or sampling design.

The sockeye for the program are collected entirely from volunteers to the Baker River trap. Adults from the entire run are trapped and incorporated proportionately into the brood to spawn on the beaches and, if there are sufficient fish, to spawn naturally in Baker Lake tributaries. Fish are not sexed or sorted prior to placement onto the beaches.

7.3) Identity.

Program fish are selected only from sockeye volunteers at the Baker River trap.

7.4) Proposed number to be collected:

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

3,000 adults annually.

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

Year	Adults Females	Males	Jacks	Eggs	Juveniles
1988	455				
1989	291				
1990	927				
1991	216				
1992	1,308				
1993	1,872				
1994	1,609				
1995	1,026	975			
1996	2,077	1,676			
1997	1,416	1,461			
1998	1,156				
1999	1,677	1,793			
2000	1,762	1,801			
2001	1,019	1,270			

Data source: Puget Sound Energy

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

Excess adults are surplused as they return to the Baker River trap and are distributed to the Skagit System Tribal Cooperative for ceremonial and subsistence purposes. Up to 1,000 adults may be placed directly into Baker Lake for natural spawning and nutrient enhancement.

7.6) Fish transportation and holding methods.

Adults are transferred into fish tankers via a water-to-water system. They are visually counted in the process. Power crowders are used to transfer the fish. Most sockeye are transferred into the tank truck without handling. Other species are counted, measured and loaded into the tank truck by hand. Adults are hauled into either beach #3 (RM 19) or #4 (RM 9) or into Baker Lake to spawn naturally.

7.7) Describe fish health maintenance and sanitation procedures applied.

NA

7.8) Disposition of carcasses.

All carcasses of spawned-out adults and adult mortality are distributed into Baker Lake tributaries for nutrient enhancement of the watershed.

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

See section 5.8 above.

SECTION 8. MATING

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

8.1) Selection method.

The sockeye for the program are collected entirely from volunteers to the Baker River trap. Adults from the entire run are trapped and incorporated proportionately into the brood to spawn in the beaches and, if there are sufficient fish, to spawn naturally in Baker Lake tributaries or distributed to the Skagit System Tribal Cooperative for ceremonial and subsistence purposes.. Fish are not sexed or sorted prior to placement into the beaches.

8.2) Males.

Not applicable.

8.3) Fertilization.

Eggs for vertical incubators are spawned in a 1:1 matings. All of the remainder spawn naturally on beaches.

8.4) Cryopreserved gametes.

NA

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

NA

SECTION 9. INCUBATION AND REARING -

9.1) Incubation:

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

See section 1.12 for overall survival from egg deposition to fry emergence.

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

NA

9.1.3) Loading densities applied during incubation.

NA

9.1.4) Incubation conditions.

Incubation of naturally deposited eggs takes place in a man-made spawning beach of washed and graded (size) rock at both beach #3 and #4. The water for both beaches up-wells through the rock substrate. The temperatures at beach #4 are stable and 47degrees. The water at beach #4 has been impacted in the past by silt from an earthen slide above the intake. The slide has been armored to stabilize it. Water temperatures and quantity is less stable at Beach #3. On occasion it is necessary to supplement spring water with creek water to meet the incubation needs. Temperatures range from the 30's to the 50's depending upon air temperatures and flow levels.

9.1.5) Ponding.

Fry emerge from the gravel volitionally and exit the pond volitionally through electronic counters.

9.1.6) Fish health maintenance and monitoring.

IHN-virus is the primary concern at the beaches. Beach #4 is divided into 4 separate sections via a hypolon plastic divider but the sections are not entirely distinct as water is able to pass from one section to another via the gravel and holes in the dividers. As a precaution, the spawning beaches are completely sanitized with chlorine between brood years. As adult spawners begin to die, they are removed from the beaches to remove potential IHN reservoirs. When fry begin to emerge from the gravel, weekly 60 fish samples (12-five fish pools) are collected from each beach sub-section. If the samples show 4 or more positive pools per 60 fish sample, the entire beach section may be destroyed.

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.

NA

9.2) Rearing:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available..

NA

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

NA

9.2.3) Fish rearing conditions

NA

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.

Fish are not reared but there is some natural rearing and feeding which apparently takes place within the confines of the spawning beach impoundments. Out-migrant fry range from 3,400 fish/pound in the beginning of the out-migration season and increase in size to about 2,500 fish/pound at the end of the out-migration season.

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

NA

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*).

NA

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

IHN-virus is the primary concern at the beaches. Beach #4 is divided into 4 separate sections via a hypolon plastic divider but the sections are not entirely distinct as water is able to pass from one section to another via the gravel and holes in the dividers. As a precaution, the spawning beaches are completely sanitized with chlorine between brood years. As adult spawners begin to die, they are removed from the beaches to remove potential IHN reservoirs. When fry begin to emerge from the gravel, weekly 60 fish samples (12-five fish pools) are collected from each beach sub-section. If the samples show 4 or more positive pools per 60 fish sample, the entire beach section may be destroyed.

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

NA

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

The spawning act and incubation is all natural in man-made spawning beaches. All fry are released into Baker Lake for natural rearing and subsequent out-migration.

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.
NA

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	1,000,000	3,500-2,400	February-May	Baker Lk/Lk Shannon
Fry				
Fingerling	60,000 60,000	<800 <150	June September	Baker Lake Baker Lake
Yearling	5,000	<20	April (1 year old)	Baker Lake

* The artificial spawning beaches can produce over 2 million fry at current loading levels. All fish are captured as post-emergent fry and released into Baker Lake to rear naturally. Numbers will vary from year to year depending upon the numbers of spawners available, sex ratio, spawning success and IHN-V levels. Releases between 1988 and 1998 (no counts for beach #3 for 1995, 96 and 97) have averaged approximately 1,549,583 fry with a range from 433,600 in 1990 to 3,658,343 in 1994. See section 1.12 and 10.3 for actual release numbers since 1988.

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

Stream, river, or watercourse: Baker Lake and Channel Creek

Release point: Baker Lake at various boat launches (from beach #4) and Channel Creek (from beach #3), a Baker Lake tributary.

Major watershed: Baker River

Basin or Region: Skagit River Basin, WRIA 3 and 4

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

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1988	614,024							
1989	702,727							
1990	433,600							
1991	461,369							
1992	498,167							
1993	2,002,008							
1994	3,658,343							
1995	3,656,768*							
1996	1,012,656*							
1997	2,241,833*							
1998	1,928,621							
1999	1,383,578							
2000	1,810,033							
2001	3,281,054							
Average		**						

Data source: Puget Sound Energy

* Release Data incomplete for these years. Not all released fish were counted.
** Unfed fry averaging between 2,500 to 3,400 fish per pound.

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

The out migration dates of unfed fry from the beaches range from mid-February to late May each year. See 10.5 for additional information.

10.5) Fish transportation procedures, if applicable.

Fry are hauled from the beach #4 out-migrant traps whenever 30,000 fry accumulate, or every three days, which ever comes first. Fry are hauled to Baker Lake in a 1,000 gallon fish tanker equipped with oxygen tanks and recirculation pumps. They are planted into the lake at several access points via a flexible hose.

10.6) Acclimation procedures.

None.

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

None.

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

NA

10.9) Fish health certification procedures applied pre-release.

See section 9.2.7

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

Not possible from the spawning beaches.

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.

Fish released are of a size and life history type that is unlikely to adversely affect listed species.

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.

Relative spawning success can be determined by comparing the numbers of adults placed in the spawning beaches and the number pf pre spawning and post spawning mortality occurring.

Relative incubation success can be determined by comparing the number of out-migrants collected to the potential egg deposition (average fecundity x known number of successful female spawners).

The success of fry, planted into the lake, can be assessed by counting out-migrant smolts from the Baker River system.

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 is provided by Puget Sound Energy.

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

Monitoring and evaluation conducted at the beaches is unlikely to encounter chinook salmon; gulper operation for monitoring migrants is conducted in conjunction with fish passage operations.

SECTION 12. RESEARCH

12.1) Objective or purpose.

Not applicable.

12.2) Cooperating and funding agencies.

12.3) Principle investigator or project supervisor and staff.

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

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

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

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

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

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

12.10) Alternative methods to achieve project objectives.

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

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

SECTION 13. ATTACHMENTS AND CITATIONS

United States v. Washington, No. 9213 Phase 1 (sub no. 85-2) Order Adopting Puget Sound Management Plan, 1985.

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:_____

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

Listed species affected: Chinook Salmon ESU/Population: Puget Sound Activity: Adult Trapping				
Location of hatchery activity: Baker R. Adult Trap Dates of activity: Apr. thru Nov. Hatchery program operator: Chuck Lavier, Mgr.				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)			Unknown	
Collect for transport b)		Unknown	Unknown	
Capture, handle, and release c)		Unknown	Unknown	
Capture, handle, tag/mark/tissue sample, and release d)			Unknown	
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)		Unknown	Unknown	
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.

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

Listed species affected: Bull Trout ESU/Population: Puget Sound Activity: Adult Trap				
Location of hatchery activity: Baker R. Adult Trap Dates of activity: Jan. thru Dec. Hatchery program operator: Chuck Lavier, Mgr.				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)			Unknown	
Collect for transport b)			Unknown	
Capture, handle, and release c)			Unknown	
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)			Unknown	
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.