

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP) DRAFT

Hatchery Program	Glenwood Springs Fall Chinook
Species or Hatchery Stock	Fall Chinook (<i>Oncorhynchus tshawytscha</i>) Samish/ Glenwood
Agency/Operator	Long Live the Kings
Watershed and Region	Eastsound (San Juan Islands) N. Puget Sound
Date Submitted	August 04, 2005
Date Last Updated	July 27, 2005

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Glenwood Springs Fall Chinook

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

Samish/Glenwood Springs Fall chinook (*Oncorhynchus tshawytscha*) - not listed

1.3) Responsible organizations and individuals

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

Washington Department of Fish and Wildlife (WDFW) provides funding, project planning and overview.

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

Funding for the yearling program is provided by WDFW’s Puget Sound Recreational Enhancement (PSRE) program. Staff level is one full time and one part time employee, with substantial volunteer effort. The annual budget is approximately \$100,000 per year.

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

Broodstock Collection; Incubation; Rearing and Release:

Glenwood Springs is located on the eastern shore of East Sound, Orcas Island, Washington. The facility is located on 300 acres of private property. It includes the springs that supply the water to the hatchery and associated rearing ponds, the entire “watershed” and the saltwater bay to which the fish return.

1.6) Type of program.

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

1.7) Purpose (Goal) of program.

Provide fingerling (300,000) and yearling (250,000*) fish that contribute to Puget Sound and southern British Columbia sport fisheries (harvest augmentation). The fundamental goal of this segregated program is to propagate the hatchery broodstock as a discrete population or gene pool that is isolated, genetically and reproductively, from naturally spawning populations. It also provides educational opportunities to the local schools.

*The yearling release goal is under consideration to be raised to 250,000. See section 1.16 for details.

1.8) Justification for the program.

The yearling program is implemented in accordance with the legislatively mandated Puget Sound Recreational Enhancement (PSRE) program. The yearling fish generally have a higher survival rate to adult than fingerlings and contribute highly to the Puget Sound recreational fisheries. This program utilizes a localized hatchery-origin chinook salmon stock for harvest in an area ideal for selective fisheries. Interactions with listed chinook salmon populations in Puget Sound and the San Juan Islands are reduced by relying on localized broodstock, by fully imprinting both fingerlings and yearlings at the release site (to minimize straying), and releasing fish as smolts in an area where there is no other salmon-bearing streams (San Juan Islands).

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

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

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.1	Water source is several springs that emerge on the property at approximately 300-600 gallons per minute (gpm). It is fish and specific pathogen free.
Intake Screening	4.2	No screens involved
Effluent Discharge	4.2	Effluent water is passed through adult holding pond that acts as a settling pond prior to discharge to Eastsound.
Broodstock Collection & Adult Passage	7.9, 2.2.3	No fish passed upstream. All hatchery fish can be identified w/ adipose-fin clip.
Disease Transmission	9.2.7	Co-Managers Fish Disease Policy. Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases.
Competition & Predation	2.2.3, 10.11	See sections 2.2.3 & 10.11

1.9) List of program “Performance Standards”.

See section 1.10.

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

Benefits:

Benefits		
Performance Standard	Performance Indicator	Monitoring & Evaluation
Assure that hatchery operations support Puget Sound Salmon Management Plan (<i>US v. Washington</i>), the Shared Strategy for Salmon Recovery, production and harvest objectives.	Contribute to a meaningful harvest for sport, tribal and commercial fisheries. Achieve a 10-year average of 0.16 % yearling smolt-to-adult survival that includes harvest plus escapement. (No fingerling smolt-to-adult survival rate at this time).	Survival and contribution to fisheries will be estimated for each brood year released. Work with co-managers to manage adult fish returning in excess of broodstock needs.
Maintain outreach to enhance public understanding, participation and support of Washington Department of Fish & Wildlife (WDFW) cooperative hatchery programs.	Provide information about agency cooperative programs to internal and external audiences. For example, local schools and special interest groups tour the facility to better understand hatchery operations. Off station efforts may include festivals, fairs, etc.	Evaluate use and/or exposure of program materials and exhibits as they help support goals of the cooperative program.
Program contributes to fulfilling tribal trust mandates and treaty rights.	Follow pertinent laws, agreements, policies and executive and judicial orders on consultation and coordination with the co-managers’.	Participate in annual coordination meetings between the co-managers to identify and report on issues of interest, coordinate management, and review programs (FBD process).
Implement measures for broodstock management to maintain integrity and genetic diversity.	A minimum of 400 adults is collected throughout the spawning run in proportion to timing, age and sex composition of return.	Annual run timing, age and sex composition and return timing data are collected. Adhere to HSRG (2004) and WDFW spawning guidelines (WDFW 1983)

<p>Region-wide, groups are marked in a manner consistent with information needs and protocols to estimate impacts to natural and hatchery-origin fish.</p>	<p>Use mass-mark (adipose-fin clip only) for selective fisheries with additional groups Ad + CWT'd for evaluation purposes (see section 10.7).</p>	<p>Returning fish are sampled throughout their return for length, sex, mass marks and coded-wire tags.</p>
<p>Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens. Follow Co-managers' Fish Health Disease Policy (1998).</p>	<p>Necropsies of fish to assess health, nutritional status and culture conditions.</p>	<p>WDFW Fish Health Section inspects adult broodstock yearly for pathogens and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, WDFW's Fish Health Section recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as deemed necessary.</p> <p>A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.</p>
	<p>Release and/or transfer examinations for pathogens and parasites.</p>	<p>1 to 6 weeks prior to transfer or release, fish are examined in accordance with the Co-managers' Fish Health Policy.</p>
	<p>Inspection of adult broodstock for pathogens and parasites.</p>	<p>At spawning, lots of 60 adult broodstock are examined for pathogens.</p>
	<p>Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens and parasites.</p>	<p>Controls of specific fish pathogens through egg/fish movements are conducted in accordance to Co-managers' Fish Health Disease Policy.</p>

Risks

Risks		
Performance Standard	Performance Indicator	Monitoring & Evaluation
Minimize impacts and/or interactions to ESA listed fish.	Hatchery operations comply with all state and federal regulations. Hatchery juveniles are raised to smolt-size (5, 80 fish/lb) and released from the hatchery at a time that fosters rapid emigration from estuary. Mass mark production fish to identify them from any naturally produced fish.	As identified in the HGMP: Monitor size, number, date of release and mass mark quality. Additional WDFW projects: straying, fish health documented.
Artificial production facilities are operated in compliance with all applicable fish health guidelines, facility operation standards and protocols including HOPPS, Co-managers Fish Health Policy and drug usage mandates from the Federal Food and Drug Administration.	Hatchery goal is to prevent the introduction, amplification or spread of fish pathogens that might negatively affect the health of both hatchery and natural reproducing stocks and to produce healthy smolts that will contribute to the goals of this facility.	Pathologists from WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, if needed.
Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring.	NPDES permit compliance (see section 1.8, Risk Aversion Measures) WDFW water rights permit compliance (not needed).	Flow and discharge reported in monthly NPDES reports.
Water withdrawals and in-stream water diversion structures for hatchery facility will not affect spawning behavior of natural populations or impact juveniles (see section 1.8; Risk Aversion Measures)	Hatchery intake structures meet state and federal guidelines where located in fish bearing streams.	All fish entering the hatchery are documented: Hatchery records. Visual observations recorded. Barrier and intake structure compliance assessed and needed fixes are prioritized.
Hatchery operations comply with ESA responsibilities.	WDFW completes an HGMP and is issued a federal and state permit when applicable.	Identified in HGMP and Biological Opinion for hatchery operations.
Harvest of hatchery-produced fish minimizes impact to wild populations.	Harvest is regulated to meet appropriate biological assessment criteria. Mass mark juvenile hatchery fish prior to release to enable state agencies to implement selective fisheries.	Agencies and tribes monitor harvests to provide up-to-date information.

1.11) Expected size of program.

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

During the past seventeen years, annual broodstock collection has varied from 62 to 3700 adults. On average, we expect an annual run size of 400-1000 fish to the hatchery.

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		
Fingerling	Eastsound at hatchery site	300,000
Yearling (smolt)	Eastsound at hatchery site	250,000*

* - See section 1.16 for details

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

The coded-wire tag data available for Glenwood Springs fall chinook indicates a 3.07% survival rate for the 1985 brood yearling release. For the 1996 and 1997 brood yearling releases, the smolt-to-adult survival rates (complete) were .12% and .21%, respectively. Average for these three years is 1.13%.

The program at Eastsound was primarily a release of zero-age smolts until the start of the current PSRE program with brood year (BY) 1996. Returns to the hatchery alone (does not include commercial or sport harvest) for the brood years of 1990-95 were an average of 0.5% of the sub-yearling release (four year olds only).

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

Sub-yearling releases of fall chinook began in 1979, with some yearlings released some years. The PSRE program began in 1996.

1.14) Expected duration of program.

The program is re-negotiated with WDFW each year.

1.15) Watersheds targeted by program.

Eastsound, San Juan Islands

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

A request was made by the PSRE to increase the yearling release from 200,000 to 250,000 for the purpose to increase resident blackmouth chinook abundance throughout Puget Sound, especially in areas 5,6,7 and 8. The increase was approved provided the fish would continue to be mass marked and represented by a CWT group to allow evaluation on survival rate, catch contribution and possible straying to other watersheds.

As per other changes to a program's production goal, the Puget Sound Salmon Management Plan (PSSMP) explicitly states "no change may be made to the Equilibrium Brood Document (program production goals) without prior agreement of the affected parties (co-managers)." This proposed change is being reviewed at this time.

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

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

During 2004-05, WDFW is writing HGMP's to cover all stock/programs produced at the Glenwood Springs complex for authorization under the 4(d) rule of the ESA.

Harvest management of chinook populations within Puget Sound is implemented through the draft Puget Sound Comprehensive Chinook Management Plan (PSCCMP) - Harvest Management Component (Puget Sound Indian Tribes and WDFW, March 2004).

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

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

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

No ESA listed population in the watershed.

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

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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 Co-manager’s (Puget Sound) Technical Review Team (2003) for the status of the listed Puget Sound chinook relative to “critical” and “viable” population thresholds.

See SaSI (2002) for the stock status of listed Puget Sound chinook populations.

- 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 ESA listed population in the watershed.

-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.

No ESA listed population spawning in the watershed (no adults passed upstream).

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

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

Interactions (predation/competition) with listed chinook salmon populations in Puget Sound and the San Juan Islands are reduced by relying on localized broodstock, by fully imprinting both fingerlings and yearlings at the release site (to minimize straying), and releasing fish as smolts in an area where there is no other salmon-bearing streams (San Juan Islands).

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

NA

-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).

We anticipate no lethal indirect take. Natural-origin listed chinook, that may stray into the adult holding pond, can be returned to the bay.

- 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.

Do not anticipate any listed chinook entering the adult holding pond. Chinook are reared only on spring water throughout the rearing and acclimation period. No other water source is in the area for chinook to imprint to. If any non-tagged chinook are encountered, they will be returned to the bay.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

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

The Glenwood Springs Hatchery fingerling and yearling fall chinook salmon HGMP is included as one of the 29 WDFW-managed plans under the co-managers' Resource Management Plan (RMP) for Puget Sound region chinook salmon hatcheries. This HGMP is in alignment with the RMP, which serves as the overarching comprehensive plan for state and tribal Chinook salmon hatchery operations in the region.

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

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

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

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

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

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

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

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

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

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

This hatchery program, and all other WDFW anadromous salmon hatchery programs within the Puget Sound Chinook ESU, operates under *U.S. v Washington* and the Puget Sound Salmon Management Plan (PSSMP) (1985). The salmon resource co-management process affirmed through these court orders, and under the court approved plan, requires that both the State of Washington and the relevant Puget Sound Tribe(s) develop *Equilibrium Broodstock Programs*. Two documents are completed each year, describing agreed upon hatchery fish production levels for each broodyear. The “Future Brood Document” is a detailed listing of agreed upon annual juvenile fish production goals. This document is reviewed and updated each spring and finalized in July. The “Current Brood Document” presents actual juvenile fish production levels relative to the annual production goals. This second document is developed in the spring after eggs spawned that year have been enumerated and actual resultant juvenile fish production levels can be estimated. Through this process, the co-managers document their agreement on the function, purpose and release strategies for all Puget Sound region hatchery programs.

3.3) Relationship to harvest objectives.

WDFW general harvest goals are to provide fishing opportunities consistent with the mandate of the agency for restoration and recovery of wild indigenous salmonid runs, the Pacific Salmon Treaty, the Puget Sound Salmon Management Plan, *US v. Washington*, and other state, federal, and international legal obligations.

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.

In past years, both tribal and non-tribal fishers caught Glenwood Springs fall chinook. That commercial fishery in Eastsound has been curtailed at times to protect the dogfish (*Squalus acanthus*) nursery.

Complete coded-wire tag recovery data is only available from Broodyear 1996 and 1997 yearling releases from this program. The following table (table 2) shows the total fisheries contribution and the proportion of that total contributed to different fisheries.

Table 2. Glenwood Springs Yearling Chinook Brood Years 1996-1997 Fisheries Contributions.

Brood Year	Program Release #	# of Fish Program Contributed	Proportion (%) of Total Catch							
			AK Ocean Troll	Canadian Ocean Troll	WA Ocean Troll	WA Treaty Troll	PS Comm. (Treaty and Non Treaty)	Canadian Ocean Sport	PS Sport	Misc. Fishery Contr. (<1% each)
1996	109,072	109	0.0	1.1	0.0	0.0	27.3	42.6	26.7	2.3
1997	195,000	91	1.0	13.0	1.8	5.4	25.9	21.9	29.9	0.8
Avg.	152,036	100	0.7	7.1	0.9	2.7	26.6	32.2	28.3	1.5

3.4) Relationship to habitat protection and recovery strategies.

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

Shared Strategy

The Shared Strategy is based on the conviction that:

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

The 5-Step Shared Strategy

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

Salmon Recovery Funding Board

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

Lead Entities

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

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

There are no habitat protection issues in this watershed. The entire watershed is protected and controlled by private ownership. The Lead Entity for this area is Whatcom County.

3.5) Ecological interactions.

(1) Salmonid and non-salmonid fishes or other species that could negatively impact the program.

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

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

Rearing and migrating adult chinook originating through the program may also serve as prey for large, mammalian predators in marine and nearshore marine areas to the detriment of population abundance and the program's success in augmenting harvest. Species that may negatively impact program fish through predation may include:

- Orcas
- Sea lions
- Harbor seals
- River otters

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

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(3) Salmonid and non-salmonid fishes or other species that could positively impact the program.

Fish species that could positively impact the program may include other salmonid species present in the marine and nearshore marine areas of the San Juan Islands. Juvenile fish of these species may serve as prey items for the chinook during their entry into the nearshore marine areas.

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

Marine fish species that prey on juvenile fish could be positively impacted by the chinook program. These species include:

- Cutthroat trout
- Pacific staghorn sculpin
- Numerous marine pelagic fish species

SECTION 4. WATER SOURCE

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

The water source is several springs that emerge on the property at approximately 300-600 gallons per minute (gpm). It is fish and specific pathogen free. The water temperature is 48-50 degrees Fahrenheit at emergence, with higher and lower temperatures where exposed to hot or cold air temperatures. The only limitation to production is the diminished flow of water that occurs during dry periods (late summer).

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 is no chance of natural fish being affected by the hatchery water withdrawal because the water sources are free of any fish. No hatchery screens needed. Large natural ponds are used for rearing with most of the effluent being settled here or at the adult holding pond prior to entering Eastsound.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

The returning adults swim directly from Eastsound into a short (less than 100 feet long) ladder that ends in a large (30' x 30' x 12' deep) concrete pond supplied with both fresh and salt water. The ladder can be closed to allow fish to remain in salt water.

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

Not applicable

5.3) Broodstock holding and spawning facilities.

The fish are held in the same pond, referred to above, until spawning. The mature adults are spawned under cover in an adjacent area.

5.4) Incubation facilities.

The eggs are incubated in vertical incubators and held there until ponding.

5.5) Rearing facilities.

The fish are reared in earthen ponds. The first rearing pond is of irregular shape (roughly 150' x 30' x 5' deep). Final rearing, after adipose fin clipping, is done in a large (5 acre) lake.

5.6) Acclimation/release facilities.

Fish are incubated and reared on spring water at the Glenwood facility. They are acclimated to salt water in the adult holding pond prior to release.

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

There have been no operational disasters that led to significant mortality.

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.

There is no chance of disease transmission to natural fish because the water sources are free of any fish and pathogen free. Since all flow is gravity fed, hatchery screens are not needed. The only concern with water loss is during dry periods in late summer. Large natural ponds are used for rearing with most of the effluent being settled out there or at the adult holding pond prior to entering Eastsound.

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.

Broodstock source is adult fall chinook returning to the Glenwood Springs facility.

6.2) Supporting information.

6.2.1) History.

The fall chinook are all of Samish origin. Green River-origin chinook eggs were first transferred to the Samish Hatchery in 1929, supplanting Columbia River-origin eggs (Kalama River and Wind River) as a source of fall chinook production for the facility (WDFG, 1932), which were first transferred in by the Feds in 1914 (WDFG, 1916). A consistent year-to-year chinook salmon egg transfer program from Green River to Samish began in 1938, in an attempt to "create a return to the Samish River that could be self-sustaining" (WDF, 1938). No chinook eggs were taken from broodstock returning to Samish prior to 1937, after which time, the chinook return was built to a sufficient level to provide egg takes (WDF, 1939; 1941). GSI analysis identifies this stock as typical of Puget Sound fall chinook (especially Soos Creek origin) and different than lower Columbia tule stocks. This stock has been propagated with no new introductions for the last four generations without significant input of genetic material from other sources, including Soos Creek. There were small releases of Skykomish summer chinook and Nooksack spring chinook from Glenwood Springs. These stocks had a different run and spawn timing from the Samish fall chinook and precautions were taken to exclude them from fall chinook egg takes.

6.2.2) Annual size.

400-1000 returning adults

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

The level of natural fish in the broodstock is unknown. Being an isolated (segregated) program, only hatchery-origin fish will be used for broodstock (beginning in 2004).

6.2.4) Genetic or ecological differences.

The Samish chinook stock is ecologically similar to Green River fall chinook. It is unknown how similar genetically they are to fall chinook in northern Puget Sound and the San Juan Islands.

6.2.5) Reasons for choosing.

This stock is used because of the history of success – since a small stream with no salmon now produces a viable contribution to the catch.

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.

Glenwood Springs chinook are not considered a viable population segment in the Puget Sound ESU nor is the hatchery population included in NOAA Fisheries Hatchery Listing Policy (June 28, 2005).

Beginning with the 2004 returns, all hatchery-origin chinook (mass marked since 1999) can be differentiated from any listed non-marked chinook salmon.

SECTION 7. BROODSTOCK COLLECTION

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

Fish are collected as mature adults and jacks.

7.2) Collection or sampling design.

Fish are collected throughout the timing of the run. The primary egg source will be from broodstock returning to Glenwood Springs. Samish Hatchery will act as a secondary backup supply if additional eggs are needed.

7.3) Identity.

There are no other stocks of salmon present in Eastsound. All fish released need to be identified by an external mark and fish must volunteer into a small ladder with distinct water supply. Therefore, identification of broodstock is not a problem.

7.4) Proposed number to be collected:

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

400-1000.

7.4.2) Broodstock collection levels for the last 12 years (e.g. 1988-99), or the most recent years available:

Year	Adults			Eggs	Juveniles
	Females	Males	Jacks		
1988	150	154		600,000	
1989	100	134		400,000	
1990	87	100		348,000	
1991	30	32		100,000	
1992	222	858		1,100,000	
1993	1700	1950	76	2,000,000	
1994	402	265	40	1,694,000	
1995	75	78	81	300,000	
1996	250	250	200	1,250,000	
1997	500	520	177	2,000,000	

Year	Adults			Eggs	Juveniles
	Females	Males	Jacks		
1998	150	150	70	600,000	
1999	150	148	109	600,000	
2000	50	50		100,000	
2001	600	622	120	1,579,800	
2002	251	241	10	969,000	
2003	112	112		479,600	

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

The fish will be disposed by sale to proper buyer, donations to food banks, burial or placed back into the saltwater environment – as coordinated by WDFW staff.

7.6) Fish transportation and holding methods.

Fish are held in the pond described in Sec. 5.1.

7.7) Describe fish health maintenance and sanitation procedures applied.

Broodstock will have salt water pumped into the pond to act as a prophylactic anti-fungal measure. A WDFW pathologist acts, as an advisor to address other fish health needs.

7.8) Disposition of carcasses.

WDFW staff will coordinate disposal of carcasses and these will be used for the following purposes: burial, food banks, or placement into Eastsound (for nutrient enhancement).

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.

Glenwood Springs chinook are not considered a viable population segment in the Puget Sound ESU nor is the hatchery population included in NOAA Fisheries Hatchery Listing Policy (June 28, 2005).

Beginning with the 2004 returns, all hatchery-origin chinook returning to Glenwood Springs will be marked and used for broodstock.

SECTION 8. MATING

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

8.1) Selection method.

Adults are selected randomly when ripe. Fish are randomly selected throughout run. All age classes are incorporated, including jacks, to capture year-to-year genetic variation.

8.2) Males.

Random selection, killed at spawning, used 1:1.

8.3) Fertilization.

Random selection, killed at spawning, used 1:1.

8.4) Cryopreserved gametes.

Not applicable

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.

Glenwood Springs chinook are not considered a viable population segment in the Puget Sound ESU nor is the hatchery population included in NOAA Fisheries Hatchery Listing Policy (June 28, 2005).

Beginning with the 2004 returns, all hatchery-origin chinook returning to Glenwood Springs will be marked and used in the mating scheme. Any non-marked chinook will not be used in the selection and mating operation.

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.

All available eggs are taken, after consultations with WDFW, for their potential need. Survival rate to ponding is approximately 90%.

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

Excess eggs would occur if there were too many eggs taken in anticipation of a need from WDFW. Disposal would be by burial or placement into Eastsound (nutrient re-cycling).

9.1.3) Loading densities applied during incubation.

4,000 eggs per tray.

9.1.4) Incubation conditions.

Spring water 48 –50 degrees Fahrenheit, 3 gallons per minute (gpm) per half stack.

9.1.5) Ponding.

Fish are ponded, after consultation with a WDFW pathologist, using small transfer containers to the small rearing pond.

9.1.6) Fish health maintenance and monitoring.

Fish are examined, prior to ponding, by a WDFW fish pathologist.

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.

Beginning with the 2004 returns, all hatchery-origin chinook returning to Glenwood Springs will be marked and subsequent eggs, during incubation, will be only hatchery-origin fish.

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.

Survival is estimated to be 95% from unfed fry to zero-age smolt and 88% from transfer to large rearing pond to release. The drop in survival is attributed to natural causes, primarily predation in the natural rearing pond. We think the fish become conditioned to the avian predators and are therefore better adapted, upon release, for survival in the natural environment.

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

Fish are reared at very low densities – difficult to measure because of the nature of the rearing containers and varying natural flow.

9.2.3) Fish rearing conditions

Fish are reared in earthen ponds on spring water, monitored regularly by a WDFW fish pathologist and daily by LLTK staff. The fish eat a large amount of natural feed, as is evidenced by the below 1:1 food conversion rate. Dissolved oxygen and other water quality parameters are monitored but not manipulated. To date, there have been no problems with rearing conditions.

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.

These fish are not reared in typical hatchery ponds or sampled at the same level of frequency since they are in systems that mimic the natural environment. Growth is monitored and feed adjusted as needed. The weight at release is approximately 90 fish per pound (fpp) for zero-age fish and 7 fpp for yearlings.

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

Not available

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

Fish eat the food supplied by WDFW, as is available through their state contract. Fish are fed at a maximum of 2% body weight per day and are supplemented by natural food.

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

Fish are checked routinely by a WDFW fish pathologist. Disease treatments are prescribed by the Fish Health Specialist as needed.

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

Fish are reared and acclimated in salt water prior to release. Aggressive screen and intake crowding, leaner condition factors, a more silvery physical appearance and loose scales during feeding events are signs of smolt development. ATPase activity is not measured.

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

Fish are reared in natural, earthen ponds, with a tremendous amount of natural food. The yearlings are exposed to avian (and other) predation and are thought to learn avoidance. Fish are fed by hand according to apparent need, instead of following a prescribed formula.

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.

Beginning with the 2004 returns, all hatchery-origin chinook returning to Glenwood Springs will be marked and fry under propagation can be differentiated from listed fish.

SECTION 10. RELEASE

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

10.1) Proposed fish release levels.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling	300,000*	80	June	Eastsound
Yearling	250,000**	5	May	Eastsound

Note: 5 fpp ~ 196 mm fork length, 80 fpp ~ 80 mm fork length

* - As per the Future Brood Document a release of 500,000 fingerlings will take place if no yearling program.

** See section 1.16 for details.

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

Stream, river, or watercourse: Eastsound, Orcas Island (saltwater)
Release point: saltwater
Major watershed: none
Basin or Region: San Juan Islands (N. Puget Sound)

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

Release	Eggs/ Unfed	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1988					250,000	43 (fpp)		
1989					0			
1990					365,000	90		
1991					360,000	62	40,000	5
1992					60,000	80	30,000	5
1993					80,000	100	170,900	6
1994					450,000	70		
1995					450,000	75		
1996					450,000	75		
1997					500,000	80	107,000	10
1998					400,000	90	109,000	4

Release	Eggs/ Unfed	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1999					367,000	95	195,000	5
2000					300,000	85	189,000	5
2001							190,000	8
2002					100,000	100	195,000	8
2003							200,000	10
Average					323,500	84	142,500	7

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

Fish have been released during the months of April - July.

10.5) Fish transportation procedures, if applicable.

NA

10.6) Acclimation procedures

Fish are acclimated to salt water for several days prior to release.

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

Since 1999 broodyear, the fingerling and yearling releases have been 100% adipose-fin clipped. In 2003 (2002 BY), 100,000 yearlings were adipose-fin clipped/coded-wire tagged (AD + CWT) while the remaining yearling group was adipose-fin clipped only. 70,000 fingerlings were also AD + CWT'd. Of the 2003 BY fish, 100,000 yearlings were AD + CWT'd while the remaining 100,000 were adipose-fin clipped only. 70,000 fingerlings were AD + CWT'd.

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

We do not anticipate any excess fish. Any excesses would be dealt with in consultation with WDFW.

10.9) Fish health certification procedures applied pre-release.

WDFW fish pathologist will examine the fish prior to release as per the Co-managers Fish Health Policy (1998).

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

There have not been floods or other failures at Glenwood Springs and LLTK does not anticipate such in the future.

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

The production and release of only smolts through fish culture and volitional release practices fosters rapid seaward migration with minimal delay in the rivers, limiting interactions with listed chinook. To minimize the risk of residualization and impact upon any natural fish in the nearshore area, hatchery fingerlings are released in June as fingerling smolts (80 fpp) and hatchery yearlings are released as smolts in May.

Interactions with listed chinook salmon populations in Puget Sound and the San Juan Islands are reduced by relying on localized broodstock, by fully imprinting both fingerlings and yearlings at the release site (to minimize straying), and releasing fish as smolts in an area where there is no other salmon-bearing streams (San Juan Islands).

A rearing parameter of the program is to attain a coefficient of variation for length of 10.0% or less in order to increase the likelihood that most of the fish are ready to migrate (Fuss and Ashbrook 1995). Such fish would be less likely to residualize in fresh water and interact with listed wild fish. No CV information at this time.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

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

Each production group is identified (see section 10.7) with distinct adipose clips and coded-wire tags for evaluation of each particular rearing and/or release strategy. This will allow for selective harvest on hatchery stocks when appropriate, monitoring of interactions of hatchery and wild fish wherever they co-mingle in riverine, estuarine and marine habitats and assessment of the status of the target population. WDFW shall monitor the chinook salmon escapement into the target and non-target chinook populations to estimate the number of tagged, un-tagged and marked fish escaping into the river each year and the stray rates of hatchery chinook into the rivers.

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

Continue to mass mark and coded-wire tag fish to allow identification at the hatchery rack and on the spawning grounds for possible straying. All broodstock returning to the hatchery will be monitored for their adipose-fin clip to differentiate from any possible listed fish.

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

For the 2003 brood fingerling and yearling groups, coded-wire tagging (Ad + CWT) and adipose-fin clipping took place. They were marked to allow for differentiating between hatchery-origin chinook and any non-marked natural-origin listed chinook that may enter the ladder as well as to determine contribution rates to fisheries, survival rates, migration patterns and possible straying to other watersheds. Funding and resources are committed at this time (2004) to monitor and evaluate this program as detailed in the Resource Management Plan for Puget Sound Chinook Salmon Hatcheries (Washington Department of Fish and Wildlife and Puget Sound Treaty Tribes, August 23, 2002)

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 will be undertaken in a manner that does not result in an unauthorized take of listed chinook.

SECTION 12. RESEARCH

12.1) Objective or purpose.

No research is planned

12.2) Cooperating and funding agencies.

12.3) Principle investigator or project supervisor and staff.

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

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

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

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

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

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

12.10) Alternative methods to achieve project objectives.

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

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

SECTION 13. ATTACHMENTS AND CITATIONS

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Washington Department of Fish and Wildlife and Puget Sound Treaty Tribes, 2002, “Puget Sound Chinook Salmon Hatcheries, Resource Management Plan”, a component of Comprehensive Chinook Salmon Management Plan, August 23, 2002. 103 pages.

SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

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

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

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

Chinook

ESU/Population	Puget Sound Chinook (<i>Oncorhynchus tshawytscha</i>)
Activity	Glenwood Springs Fall Chinook Program
Location of hatchery activity	Glenwood Springs Hatchery, Eastsound, WA
Dates of activity	Fingerling-August-June Yearling- June-May
Hatchery Program Operator	WDFW

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

- 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.