HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	Whatcom Creek Pink Program
Species or Hatchery Stock	Nooksack River Pink Salmon (*Oncorhynchus gorbuscha)*
Agency/Operator	Bellingham Technical College
Watershed and Region	Whatcom Creek North Puget Sound
Date Submitted	August 04, 2005
Date Last Updated	August 3, 2005

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Whatcom Creek Pink Program

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

Nooksack River Pink Salmon (*Oncorhynchus gorbuscha*) - not listed

1.3) Responsible organizations and individuals

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Name (and title):	Chuck Phillips, Region 4 Fish Program Manager Ted Thygesen, Complex Manager	
Agency or Tribe:	Washington Department of Fish and Wildlife	
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Email:	**phillcep@dfw.wa.gov**	**thygetlt@dfw.wa.gov**

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

This facility works closely with the WDFW Kendall Creek Hatchery and often sharing both labor and equipment between the two facilities.

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

Bellingham Technical College provides the hatchery facilities through a lease with the City of Bellingham Parks Department, which owns the property. The college also provides most operational costs and provides one full-time hatchery manager and student labor. Funding for fish feed is through Aquatic Lands Enhancement Account (ALEA) funding provided to WDFW for Co-op fish production. Surplus egg and carcass monies are also utilized.

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

Whatcom Creek Hatchery:	Located at the mouth of Whatcom Creek (01.0566) at RM 0.5.

1.6) Type of program.

Segregated (isolated) harvest

1.7) Purpose (Goal) of program.

The primary goal of this program is to provide educational benefits in fish culture and only secondarily to meet sport harvest needs. The program is programmed to release 500,000 pink salmon.

1.8) Justification for the program.

Establishing an egg source will provide educational benefits in the culturing and releasing of pink salmon from this facility. Whatcom Creek has not been identified by the PSTRT (2003) as a watershed where an indigenous chinook or summer chum population were historically present or whether such populations exists today. Potential impacts from this program, if they occur, would occur in the nearshore environment in common with those releases from other programs.

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

Table 1. Summary of risk aversion measures for the Whatcom Creek pink program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.2	Surface water and city water used for incubation and rearing. No listed species are known to occur in Whatcom Creek.
Intake Screening	4.2	No listed species are known to occur in Whatcom Creek.
Effluent Discharge	4.2	No listed species are present within Whatcom Creek. No NPDES permit is required because the facility produces less than the 20,000 pounds per year criteria set by WDOE as the limit for concern regarding hatchery effluent discharge effects.
Broodstock Collection & Adult Passage	7.9, 2.2.3	Pink salmon are collected at Whatcom Creek. No listed species are known to occur in Whatcom Creek.
Disease Transmission	9.2.7	The program is operated consistent with the Co-managers Fish Health Policy.
Competition & Predation	2.2.3, 10.11	Releases occur in Whatcom Creek where the Puget Sound Technical Recovery Team (TRT) has not identified a chinook or summer chum salmon population. Life history and feeding habits of pink salmon are expected to result in limited competitive and predatory interactions with listed chinook and summer chum.

1.9) List of program "Performance Standards".

See section 1.10

1.10) List of program "Performance Indicators".

Benefits:

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Assure that hatchery operations support Puget Sound Salmon Management Plan (US v Washington), Hood Canal Salmon Management Plan, 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 1.0% smolt-to-adult survival that includes harvest plus escapement.	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 WDFW hatchery programs.	Provide information about agency 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, classroom participation, stream adoptions and fairs.	Evaluate use and/or exposure of program materials and exhibits as they help support goals of the information and education program. Record on-station organized education and outreach events.
Program contributes to fulfilling tribal trust responsibility mandates and treaty rights.	Follow pertinent laws, agreements, policies and executive and judicial orders on consultation and coordination with Native American tribal governments.	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 700 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 WDFW spawning guidelines (WDFW 1983)
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).	Necropsies of fish to assess health, nutritional status and culture conditions.	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. A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.
	Release and/or transfer exams for pathogens and parasites.	1 to 6 weeks prior to transfer or release, fish are examined in accordance with the Co-managers Fish Health Policy.

	Inspection of adult brood-stock for pathogens and parasites.	At spawning, lots of 60 adult broodstock are examined for pathogens.
	Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens and parasites.	Control of specific fish pathogens through eggs/fish movements is conducted in accordance to Co-managers Fish Health Disease Policy.

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 (500 fish/lb) and released at a time that fosters rapid migration downstream.	Monitor size, number and date of release. 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 naturally 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, as needed.
Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring.	NPDES permit compliance WDFW water right permit compliance	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.	Hatchery intake structures meet state and federal guidelines where located in fish bearing streams.	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.	Agencies and tribes to provide up-to-date information monitor harvests.

1.11) Expected size of program.

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

Proposed collection level is 700 adult pink salmon.

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

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry	Whatcom Creek (01.0566)	500,000*
Yearling (smolt)		

***Program has been scaled back from a 2,000,000 to a 500,000 release in the last couple of years.**

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

This is a new program with a small initial release of fish in 1998. Fish were first collected in 1997 (10) and 1999 (423) from the Nooksack River. In broodyears 2001 and 2003, adult fish returned to the Whatcom Creek Hatchery weir. Those numbers were 2,568 and 9,843, respectively.

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

1997.

1.14) Expected duration of program.

Ongoing

1.15) Watersheds targeted by program.

Whatcom Creek (01.0566)

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

Alternative action that was considered and implemented was that all broodstock was to be taken at Whatcom Creek and not from the Nooksack River (Middle Fork). In 2001 enough fish returned to the Whatcom Creek trap to collect broodstock. For 2003 and beyond, all broodstock collection will take place at Whatcom Creek.

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 Whatcom Creek facility for authorization under the 4(d) rule of the ESA.

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.

Whatcom Creek has not been identified by the PSTRT (2003) as a watershed where an indigenous chinook or summer chum population were historically present or whether such populations exists today. Potential impacts from this program, if they occur, would occur in the nearshore environment in common with those releases from other programs.

Nooksack Chinook.

Three stocks of chinook are identified in the Nooksack basin. The two native stocks are the early returning North Fork Nooksack Chinook and the South Fork Nooksack Chinook and an introduced Samish, Mainstem Nooksack Fall Chinook.

Like the Elwha fall Chinook, the two Nooksack early returning Chinook stocks are among the most genetically distinct Chinook populations in Puget Sound. Significant differences occur in the life history of the two native stocks. Regarding spawn timing, the average date of peak redd count for the South Fork stock averaged September 24, while the peak for the North Fork is about two weeks earlier (Marshall et al, 1995). This may result in earlier juvenile emergence from redds in the North Fork, but the warmer waters in the South Fork probably accelerate emergence of fish in this area. Peak catches of Chinook fry in smolt traps occurred earlier in the North Fork than in the South Fork (Wunderlich, Meyer, and Boomer, 1982). However, fry were present in both forks over the same general time frame of early February through early May. The two Nooksack stocks also differ in juvenile out-migration strategies. Based on limited data, approximately 95% of the natural-origin North Fork adults out-migrated as sub-yearlings in their first year of life. In contrast, in the South Fork, 55-67% of the adults had yearling scale patterns, which indicates that a significant component of this stock remained in the river for over a full year before migrating to saltwater (Marshall et al, 1995).

The third population in the Nooksack-Samish watersheds consists of late returning Chinook salmon, which may once have historically occupied the Nooksack basin. However, if that is the case, this stock has been heavily influenced by introductions from Soos Creek Hatchery fall Chinook from the Green River. Chinook salmon from Soos Creek were introduced in 1965, 1972, 1973 and 1977. Kalama River and Wind River Chinook salmon (Columbia River stocks) were introduced between 1914 and 1925, but records show no eggs were taken from returning adults. The hatchery and wild population has reproduced with no new introductions from other sources for the last four generations. Genetic analyses indicate that the fall Chinook hatchery stock (Kendall/Samish stock) in the Nooksack River is closely related, but diverged, from Green River-origin Puget Sound fall Chinook salmon.

Bull Trout *(Salvelinus confluentus)*

Three stocks of native char have been identified in the Nooksack basin. These are the Lower Nooksack, Canyon Creek and Upper Middle Fork stocks. The latter is isolated from the rest of the basin due to a diversion dam. The USFWS is supportive of laddering the dam to provide passage. Char exhibit anadromous, fluvial, and resident life histories. Spawning occurs in the fall. After spawning, anadromous adults move downriver and enter the estuary during the spring while fluvial adults disperse throughout the upper river. Sub-adults may also enter the river from the estuary in late winter and early spring. Adults return to spawning staging areas in late summer.

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

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

Preliminary critical and viable population thresholds have been identified. NOAA Fisheries (2000) has identified for both the NF and SF Nooksack populations the critical threshold of 200 and 1,250 for the viable population. The Co-manager's (Puget Sound) Technical Review Team (PSTRT) has identified only a critical threshold of 1,000 for both NF and SF populations (PSTRT 2003). The SaSI report (WDFW, unpublished 2002) determined that the NF and SF chinook are "critical". The Samish, Mainstem Nooksack Fall Chinook is an introduced hatchery stock and its status is "unknown". Dolly Varden/Bull Trout are "unknown".

- 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.

Brood year 1992 to 1997 recruit/spawner levels for natural-origin North Fork Nooksack spring chinook salmon were estimated using available data (from Castle et al., 2002):

Brood Year	Spawners	Adult Returns	Recruits/Spawner
1992	493	181	0.37
1993	445	95	0.21
1994	45	24	0.62
1995	230	32	0.14
1996	535	171 *	0.32
1997	617	32 **	0.05

* Excludes five-year-old recruits (data not yet available).

** Excludes four and five year old recruits (data not yet available).

-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.

ESTIMATED ESCAPEMENT OF NOOKSACK CHINOOK STOCKS

YEAR	SOUTH FORK CHINOOK	NORTH FORK CHINOOK
1984	188	45
1985	445	255
1986	170	224
1987	248	179
1988	233	452
1989	606	300
1990	142	10
1991	365	107
1992	103	493
1993	235	445
1994	118	45
1995	290	228
1996	203	538
1997	180	621
1998	157	366
1999	166	892
2000	207	1,242
2001	267	7,190*
2002	289	3,687
2003	204	3,107
2004	130	2,064

* - Does include the 4,765 hatchery "putbacks" to the NF Nooksack.

Note: In 1999 and 2000, 55.6% and 32.4%, respectively, of the carcasses surveyed in the SF Nooksack were strays from the NF Nooksack Kendall stock rebuilding program (Ned Currance, Nooksack tribal biologist, personal communication).

-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.

Year	NOR's	HOR's	% of Natural Origin on NF
1995	171	59	74.3
1996	209	325	39.1
1997	74	543	11.9
1998	37	333	10.5
1999	85	738	10.3
2000	160	1,082	12.8
2001	240	1,945*	10.9
2002	224	3,517	5.9
2003	210	2,647	7.3
2004	318	1,428	18.0

* - Does not include the 4,765 hatchery "putbacks" to the NF Nooksack.

In the North Fork Nooksack, the 1995-1999 average wild / hatchery adult return ratio was 0.31:1 (range 0.11:1 to 3.3:1). There is limited data indicating the proportion of hatchery-origin chinook salmon comprising escapement to the South Fork Nooksack River (Pete Castle, Area Biologist, WDFW). Kirby (2002) estimated that hatchery-origin stray chinook salmon comprised 42.9%, 24.0%, and 36.5% of the total adult chinook salmon escapement in the South Fork in 1999, 2000, and 2001, respectively. For 2002-04, the estimated % HORs were 53.7%, 64.2% and 23.5%, respectively (Sanford, WDFW pers. comm.).

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.

Broodstock Collection:
Impacts during collection of pink salmon are low for chinook or summer chum, as no listed species are known to exist or have existed in Whatcom Creek (PSTRT 2003).

Disease Effects:
Pathogens are not unique to hatcheries. Hatchery-origin fish may have an increased risk of carrying fish disease pathogens because higher rearing densities of fish in the hatchery may stress fish and lower immune responses. Under certain conditions, hatchery effluent has the potential to transport fish pathogens out of the hatchery, where natural fish may be exposed. These impacts are addressed by rearing the pink salmon at lower densities, within widely recognized guidelines (Piper et al 1982), continuing well-developed monitoring, diagnostic, and treatment programs already in place (Co-manager's Fish Health Policy 1998).

Juvenile Releases:
Preliminary results (2005, HSRG Research Workshop) from ongoing research being conducted by Duffy et al. (2002) in assessing the nearshore distribution, size structure, and trophic interactions of juvenile salmon and potential predators and competitors, in northern and southern Puget Sound indicate that the dominant predator of salmonids in the nearshore and estuary environments is cutthroat trout. Chinook were found to prey largely on herring, sandlance, chum, and when present, pink salmon.

- 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).

See "take" table

- 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.

As indicated in section 11.0, monitoring and evaluation actions are taking place to determine possible ecological effects that may result from this type of program. If these studies show potential ecological risks to listed chinook salmon then WDFW staff along with the affected party would determine an appropriate plan and consult with NOAA fisheries, if needed.

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 Whatcom Creek pink salmon program HGMP is included as one of 46 WDFW-managed plans under the co-managers' non-chinook Resource Management Plan (RMP) for Puget Sound region non-chinook salmon hatcheries. This HGMP is in alignment with the RMP, which serves as the overarching comprehensive plan for state and tribal non-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. These constraints are designed to limit adverse effects on cultured fish, wild fish and the environment that might result from hatchery practices. Following is a list of guidelines, policies and permit requirements that govern WDFW hatchery operations:

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

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

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

Stock Transfer Guidelines. This document provides guidance in determining allowable stocks for release from 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 (WDF 1991).

Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State. This policy designates and delineates Fish Health Management Zones and defines inter and intra-zone transfer policies and guidelines for eggs and fish. These are designed to limiting the spread of fish pathogens between and within watersheds (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 program will be operated in accordance with a Cooperative Fish Production Agreement between Earl Steele, representing the Bellingham Technical College, and WDFW. That agreement will be consistent with the Future Brood Document and with this HGMP.

This hatchery, as well as other WDFW hatcheries, operates under *U.S. v Washington* that provides the legal framework for coordinating these programs, defining artificial production objectives, and maintaining treaty-fishing rights through the court-ordered Puget Sound Salmon Management Plan (1985). This co-management process requires that both the State of Washington and the relevant Puget Sound Tribe(s) develop program goals and objectives and agree on the function, purpose and release strategies of all hatchery programs. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring and finalized in July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are collected.

3.3) Relationship to harvest objectives.

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.

A recreational fishery may occur if the adult return level to the hatchery exceeds that needed for egg take.

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)

Whatcom County, with the passage of resolutions by the Nooksack Tribe, Lummi Nation, Cities of Ferndale, Everson, Lynden, Sumas, Nooksack, Blaine and Bellingham; and Skagit and Whatcom counties, was selected to be the Lead Entity in the Nooksack River basin. The County is working on a long-term strategy to ensure the protection and restoration of healthy salmon populations. The local Watershed Recovery Plan being developed will "rollup" into the regional salmon recovery plan (Shared Strategy for Salmon Recovery). This "Shared Strategy" will become the official ESA recovery plan when it is completed.

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 Whatcom Creek Hatchery pink salmon 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 Whatcom Creek pink survival rates through predation on newly released, emigrating juvenile fish in the freshwater and marine areas. Certain avian and mammalian species may also prey on juvenile pinks 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 pink salmon through predation include the following:

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

Rearing and migrating adult pink salmon originating through the program may also serve as prey for large, mammalian predators in marine areas, nearshore marine areas and in the Whatcom Creek estuary 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).

- Chum and pink salmon

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 Whatcom Creek watershed through natural and hatchery production. Decaying carcasses of spawned adult fish may contribute nutrients that increase productivity in the watershed, providing food resources for the emigrating pink salmon.

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

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

- Northern pikeminnow
- Coho salmon
- Chinook salmon
- Steelhead
- Pacific staghorn sculpin
- Numerous marine pelagic fish species

SECTION 4. WATER SOURCE

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

The Whatcom Creek Hatchery uses a gravity-fed water source from Whatcom Creek as well as city water for incubation to hatching and rearing to release.

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 known listed species known to occur in Whatcom Creek. No NPDES permit is required because the facility produces less than the 20,000 pounds per year criteria set by WDOE as the limit for concern regarding hatchery effluent discharge effects.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Fish volunteer into the facility by way of a twelve-step fish ladder rising 10 vertical feet.

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

NA

5.3) Broodstock holding and spawning facilities.

Whatcom Creek Hatchery has two 4,500 cubic foot adult holding ponds.

5.4) Incubation facilities.

Eggs are incubated at Whatcom Creek Hatchery to hatching in 36 vertical incubators using well water.

5.5) Rearing facilities.

There are two tanks of 10,500 cubic feet each, measuring 60' in diameter by 4' deep. Fish can also be reared in the adult holding ponds.

5.6) Acclimation/release facilities.

Fish are released directly from the tanks or the holding ponds described above into the estuary at high tide and during the hours of darkness.

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

No operational difficulties or disasters have led to any significant fish 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.

An emergency generator exists on-station to provide power to a back-up pump in case of electrical outages. Also, can turn off water to ponds and recycle within system in case of surface water quality deterioration (oil spills, etc.). Alarm system tied into hatchery managers cell phone in case of emergency.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

6.1) Source.

The goal is to collect adult pink salmon returning to the Whatcom Creek trap. Initially, broodstock source was the Nooksack River (Middle Fork), but in 2001 enough fish returned to the Whatcom Creek trap to collect broodstock. For 2003 and beyond, all broodstock collection will take place at Whatcom Creek.

6.2) Supporting information.

6.2.1) History.

The Whatcom Creek pink salmon program is a new program. The initial broodstock source was the Nooksack River (Middle Fork) in 1997 and 99'. In 2001 enough fish returned to the Whatcom Creek trap to collect broodstock. For 2003 and beyond, all broodstock collection will take place at Whatcom Creek.

6.2.2) Annual size.

700 adults

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

For brood years 97 and 99, 100% of the broodstock were fish from the MF Nooksack River. In broodyear 2001, all broodstock was collected at the Whatcom Creek trap. The goal was for the program to establish a separate hatchery run to preclude the need for any further mining of the natural population.

6.2.4) Genetic or ecological differences.

No genetic or ecological differences are known.

6.2.5) Reasons for choosing.

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.

Impacts during selection of pink salmon are low for chinook or summer chum, as no listed species are known to exist or have existed in Whatcom Creek (PSTRT 2003).

SECTION 7. BROODSTOCK COLLECTION

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

Adults.

7.2) Collection or sampling design.

Only adult pink salmon that volunteer into the facility by way of the fish ladder described in 5.1 will be utilized for broodstock.

7.3) Identity.

7.4) Proposed number to be collected:

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

Approximately 700 adults (350:350)

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		
1995					
1996					
1997	5	5		2,500	
1998					
1999	218	205		256,000	
2000					
2001	831	653		666,000	
2002					
2003	664	645		900,000	

Note - BY 2001 was first year adult pinks were collected at the Whatcom Cr. facility.

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

All pink salmon in surplus of broodstock needs are donated to a food bank.

7.6) Fish transportation and holding methods.

NA

7.7) Describe fish health maintenance and sanitation procedures applied.

Fish health maintenance and sanitation procedures are applied as per the Co-manager's Fish Health Policy (1998).

7.8) Disposition of carcasses.

All pink salmon carcasses are donated to a food bank.

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.

Impacts during collection of pink salmon are low for chinook or summer chum, as no listed species are known to exist or have existed in Whatcom Creek (PSTRT 2003).

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 selected randomly over the entire run.

8.2) Males.

See section 8.3. Backup males are not anticipated to be used.

8.3) Fertilization.

With large enough returns (as in BY 2001), will be using 5 X 5 matrix (5 females: 5 males). Will immerse eggs in an iodine solution for one hour for disease prevention.

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 -

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.

See section 7.4.2 for numbers of eggs taken.
In 2001, 560,000 eggs were taken and after eyeing 520,000 remained (93% survival). At release 514,000 were planted into Whatcom Creek. Survival from eye-up to release was 98.8%.

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

If a surplus of eggs does arise, they are sold to a contract buyer.

9.1.3) Loading densities applied during incubation.

10,000 eggs are loaded per tray at a flow rate of 3 gpm.

9.1.4) Incubation conditions.

Dissolved oxygen levels are monitored and a minimum of 7 ppm is maintained. Temperatures range from the low/mid 40's to the mid 50's. Dissolved oxygen levels are at saturation.

9.1.5) Ponding.

Fry are ponded when the fry are 100% buttoned up and no yolk is found inside. The fry are forced - ponded when they are at the proper size.

9.1.6) Fish health maintenance and monitoring.

Eggs are treated with formalin to control fungus. After shocking, eggs are picked using a Jensorter mechanical egg picker and are not treated after that time. After hatching, dead eggs are removed using hand egg pickers and vexar screens are added to the trays.

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.

The average survival rate of fry to release: 98 to 99%.

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

Loading densities are never to exceed .5 lbs/ft^3. They were .25 lbs/ft^3 for BY 2001.

9.2.3) Fish rearing conditions

Temperatures range between the high 40's to the high 50's.

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.

Not available.

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*).

Use Moore-Clarke dry diet at a feeding rate up to 6% B.W./day. Food conversion efficiency is approximately 1:1.

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

WDFW fish pathologists check these fish routinely. Disease treatments are prescribed by the Fish Health Specialist as needed.

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

Gill ATPase activity is not monitored. The migratory state of the release population is determined by fish behavior. Aggressive screen and intake crowding, a more silvery physical appearance and loose scales during feeding events are signs of smolt development.

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

NA

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				
Fry	500,000	500	April	Whatcom Creek
Fingerling				
Yearling				

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

Stream, river, or watercourse: Whatcom Creek (01.0566)
Release point: Whatcom Creek (01.0566) at RM 0.5
Major watershed: Nooksack
Basin or Region: 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
1997								
1998			1,561	1,200				
1999		{tc \l5 "}						
2000			218,000	500				
2001	{tc \l5 "}							
2002			514,000	800				
2003								
2004			798,000	500				
Average			382,890	750				

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

Fish have been forced released into the estuary at high tide during hours of darkness in the months of February and March.

10.5) Fish transportation procedures, if applicable.

NA

10.6) Acclimation procedures

Fish are reared on Whatcom Creek water the entire time.

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.

None anticipated.

10.9) Fish health certification procedures applied pre-release.

A WDFW Fish Health Specialist checks and certifies fish prior to release.

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

If a problem arises and emergency back-up systems fail then the pinks will be released into the estuary.

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 hatchery-produced pinks may serve as prey for larger migrating salmonids and other fish in the marine environment.

Preliminary results (2005, HSRG Research Workshop) from ongoing research being conducted by Duffy et al. (2002) in assessing the nearshore distribution, size structure, and trophic interactions of juvenile salmon and potential predators and competitors, in northern and southern Puget Sound indicate that the dominant predator of salmonids in the nearshore and estuary environments is cutthroat trout. Chinook were found to prey largely on herring, sandlance, chum, and when present, pink salmon.

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.

The co-managers conduct numerous ongoing monitor programs, including catch, escapement, marking, tagging, and fish health testing. The focus of enhanced monitoring and evaluation programs will be on the risks posed by ecological interactions with listed species. WDFW is proceeding on four tracks:

1) An ongoing research program conducted by Duffy et al. (2002) is assessing the nearshore distribution, size structure, and trophic interactions of juvenile salmon, and potential predators and competitors, in northern and southern Puget Sound. Funding is provided through the federal Hatchery Scientific Review Group. Preliminary results by Duffy et al. (2005, HSRG Research Workshop) indicated that the dominant predator of salmonids in the nearshore and estuary environments is cutthroat trout. Chinook were found to prey largely on herring and sandlance. The biggest prey item for coho was marine plankton and pink and chum salmon.

2) A three-year study of the estuarine and early marine use of Sinclair Inlet by juvenile salmonids is nearing completion. The project has four objectives:

a) Assess the spatial and temporal use of littoral habitats by juvenile chinook throughout the time these fish are available in the inlet;
b) Assess the use of offshore (i.e., non-littoral) habitats by juvenile chinook;
c) Determine how long cohorts of juvenile chinook salmon are present in Sinclair inlet;
d) Examine the trophic ecology of juvenile chinook in Sinclair Inlet. This will consist of evaluating the diets of wild chinook salmon and some of their potential predators and competitors. Funding is provided by the USDD-Navy.

3) WDFW is developing the design for a research project to assess the risks of predation on listed species by coho salmon and steelhead released from artificial production programs. Questions that this project will address include:

a) How do trucking and the source of fish (within watershed or out of watershed) affect the migration rate of juvenile steelhead?
b) How many juvenile chinook salmon of natural origin do coho salmon and steelhead consume?
c) What is the rate of residualism of steelhead in Puget Sound Rivers?
Funding needs have not yet been quantified, but would likely be met through a combination of federal and state sources.

4) WDFW is assisting the Hatchery Scientific Review Group in the development of a template for a regional monitoring plan. The template will provide an integrated assessment of hatchery and wild populations.

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

See Section 11.1.1.

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.

Risk aversion measures will be developed in conjunction with the monitoring and evaluation plans.

SECTION 12. RESEARCH

12.1) Objective or purpose.

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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Hershberger, W.K. and R.N. Iwamoto. 1981. Genetics Manual and Guidelines for the Pacific Salmon Hatcheries of Washington. Univ. of Wash. College of Fisheries. Seattle, WA. 83 pp.

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Puget Sound Technical Recovery Team (PS TRT). 2003. (Draft) Independent populations of chinook salmon in Puget Sound - Puget Sound TRT public review draft (May 18, 2004 version). Northwest Fisheries Science Center. National Marine Fisheries Service. 92p.

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Washington Department of Fisheries. 1991. Stock Transfer Guidelines. Hatcheries Program, Washington Department of Fisheries. Olympia, WA

Washington Department of Fish and Wildlife. 1996. Fish Health Manual. Hatcheries Program, Fish Health Division, Washington Department of Fish and Wildlife, Olympia, WA.

Washington Department of Fish and Wildlife and Washington Treaty Indian Tribes. 1998. Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State. Olympia, WA.

Wunderlich, R., J. Meyer and R. Boomer. 1982. Nooksack River juvenile spring chinook salmon investigations. U.S. Fish and Wildlife Service, Olympia, WA. 61 p.

SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

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

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

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

Chinook

ESU/Population	Puget Sound Chinook *(Oncorhynchus tshawytscha)- Nooksack*
Activity	Whatcom Creek Pink Program
Location of hatchery activity	Whatcom Creek Hatchery, RM 0.5 of Whatcom Creek (01.0566) Kendall Creek Hatchery, RM 46 of NF Nooksack River (01.0120)
Dates of activity	January- 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	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.