HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Puyallup Tribes' Puyallup Acclimation Sites
Species or Hatchery Stock:	Fall Coho, Voights Creek Stock
Agency/Operator:	Puyallup Tribe of Indians
Watershed and Region:	Puyallup River/ WRIA 10
Date Submitted:	March 10, 2003
Date Last Updated:	May 1, 2013

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Voights Creek Hatchery, Electron Acclimation Ponds, Lake Kapowsin Net Pen Program

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

Fall Coho, *Oncorhynchus ktsutch*, not listed

1.3) Responsible organization and individuals

Indicate lead contact and on-site operations staff lead.

Name (and title): Blake Smith, Enhancement Chief
Agency or Tribe: Puyallup Indian Tribe
Address:

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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), are responsible for the operation of the Voights Creek Hatchery where broodstock collection occurs.

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

Funding sources:	Puyallup Tribe/BIA
Staffing level:	2 full time/1 part time
Annual hatchery program operational costs:	~$45,000

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

Lake Kapowsin Net-Pen Program – Pens are located on Lake Kapowsin at River Mile 5.0 (10.0600)

Rushingwater Acclimation Pond – Pond is located at River Mile 0.5 on Rushingwater Creek (10.0625) that is a left bank tributary at River Mile 1.1 on the Mowich River (10.0624).

Mowich River Acclimation Pond – Pond is located at River Mile 0.2 on the Mowich River (10.0624).

Cowskull Creek Acclimation Pond – Pond is located at River Mile 0.1 on Cowskull Creek (10.0680) that is a Left Bank tributary to the Puyallup River (10.0021) at River Mile 44.8.

1.6) Type of program.
Integrated Recovery

1.7) Purpose (Goal) of program.

The Puyallup Tribes' Fall Coho program is for restoration and harvest purposes.

1.8) Justification for the program.

The integrated recovery program initial rearing is at Voights Creek Hatchery then imprinted and released out of the acclimation ponds located in the Upper Puyallup River above Electron Dam and at Lake Kapowsin. Fifty percent of the coho are CWT and 100 percent externally marked with an adipose clip at time of release. Adult coho salmon have been blocked from migrating above Electron Dam for 96 years. This program is to reestablish a viable coho salmon run above Electron Dam in the 30 miles of usable salmonid habitat.

Fish habitat in WRIA 10, the Puyallup/White river system, has been heavily impacted by anthropogenic activities in the past, resulting in the 1999 ESA listing of White River spring Chinook, Puyallup River Fall Chinook, Puyallup/White bull trout, and recently Puyallup/White steelhead. The White River itself, originally a tributary of the Green River, was permanently diverted into the Puyallup via an artificially engineered channel nearly a century ago, and remains mostly diked and revetted from Auburn downstream. The lower Puyallup was also channelized at that time and disconnected from its side channels and flood plain. Wood was removed wholesale, as were riparian areas, and little useable habitat remains in the lower reaches of these rivers today. Upstream, hydroelectric projects were built on both the Puyallup and White early in the last century.

The project on the Puyallup completely blocked anadromous access at Electron until a fishway was constructed in 2006. Today most of the flow and outmigrating smolts are passed through an unscreened flume, bypassing 18 miles of productive rearing area and requiring stressful hand removal of fish at the Electron Forebay. This remains a major limiting factor to Puyallup River fish recovery.

1.9) List of program "Performance Standards".

Program Goal: Integrated Recovery

Artificially propagated fish will increase the abundance of an existing wild population or reestablish natural spawning populations in areas where they have been extirpated.

Justification:
Benefits:
- Increase the total abundance of the composite natural/hatchery population

- Result in an increasing trend of Natural Origin Recruits (NORs).

Goal (Section 1.7-1.8)	**Performance Standard** (Section 1.9)	**Performance Indicator** (Section 1.10)	**Monitoring requirements**
Increase the total abundance of composite natural/hatchery population	The abundance of spawning fish increases to escapement goal set by Management Plan	Estimate spawning abundance of natural spawner	Requires spawning ground survey or other method of estimating escapement. Currently, there is an adult fish trap at Electron Dam that will enumerate the number of adult coho migrating above the dam.
Increasing trend of NORs	The number NOR fish in the naturally spawning population increases	Estimate abundance of NOR coho returning to river	Requires escapement estimate and sampling for a unique hatchery mark. Hatchery mark or tag required to separate hatchery spawners from NOR.
	The return per spawner for naturally spawning fish (NRR) remains above replacement level	Estimate return per spawner for natural spawning fish (NRR).	Requires escapement estimate and sampling for a unique hatchery mark. Hatchery mark or tag required to separate hatchery spawners from NOR.
Maintain the total abundance of composite natural/hatchery population	The abundance of returning fish provides the broodstock set by Management Plan	The broodstock collected meets the goals set by Hatchery management plan.	

1.10) List of program "Performance Indicators", designated by "benefits" and "risks."
See 1.9)

1.11) Expected size of program.
Expected size of program is 100,000 yearling smolts destined for the Upper Puyallup River acclimation ponds and 200,000 yearling smolts to Lake Kapowsin.

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

All broodstock are collected at the Voights Creek Hatchery operated by the WDFW located on Voights Creek (10.0141) a Left Bank tributary to the Carbon River (10.0413) at River Mile 4.0.

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location. (*Use standardized life stage definitions by species presented in* Attachment 2).

Life Stage	Release Location	Annual Release Level
Yearling	Acclimation Ponds	100,000
Yearling	Kapowsin lake Net Pens	200,000

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

Estimated smolt to adult survival to fisheries and escapement information is given in the following table for fingerling releases at Upper Puyallup River acclimation ponds and net pens:

Tagcode	BrYr	Date.Rel	Release Site	**% Survival**
63-25-84	2003	14-March-2005	Rushwater/Cowskull Accl. Ponds	0.73
63-30-68	2004	30-May-2006	Rushwater/Cowskull Accl. Ponds	1.50
63-36-94	2005	8-May-2007	Rushwater/Cowskull Accl. Ponds	1.75
63-52-58	1993	26-April-1995	Kapowsin Lake Net Pens	4.22
63-56-57	1994	24-April-1996	Kapowsin Lake Net Pens	1.69
63-61-60	1995	2-May-1997	Kapowsin Lake Net Pens	1.17

Source: RMIS 12-11-12
http://www.rmis.org

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

The first acclimation pond releases for yearling coho in the Upper Puyallup River started on April 09, 1998 as part of a Resource Enhancement Agreement between Puget Sound Energy and Puyallup Tribe of Indians. The first net-pen releases for yearling coho in Lake Kapowsin was in the Spring of 1995 as part of an agreement between WDFW, PTF, and Champion International.

1.14) Expected duration of program.

The Upper Puyallup Acclimation Pond Program expects to operate until an interim escapement goal 2000 natural-origin adult coho are passed above Electron Dam 3 out of 4 years.

1.15) Watersheds targeted by program.

Acclimation coho releases are targeting the Upper Puyallup River Watershed (Above River Mile 31.2) including the North (10.0699) and South Forks (10.0021) of the Puyallup River, Mowich River (10.0624), Meadow Creek (10.0630), Deer Creek (10.0685), Rushingwater Creek (10.0625), LeDout Creek (10.0620), Neisson Creek (10.0622), Kellog Creek (10.0621), and all tributaries associated with the Puyallup River system. Net-pen coho releases target Kapowsin, Ohop and several other small creeks in the Lake Kapowsin watershed.

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

Currently no other actions are being considered to obtain program goals.

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

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

The HGMP was submitted to NMFS in March, 2003 for review for its compliance with criteria under limit 6 of the ESA 4(d) rule for listed Puget Sound ESU Chinook salmon.

This updated HGMP constitutes the application for the initiation of the program under the Co-managers' Chinook Salmon Hatchery Resource Management Plan (RMP), submitted for ESA and NEPA compliance through an on-going, programmatic review process led by the NMFS Salmon Management Division, Hatcheries and Inland Fisheries Branch. The ESA review portion of the process will lead to a determination of whether the plans address criteria defined in the ESA (4)d Rule Limit 6 for the Puget Sound Chinook and Hood Canal summer chum salmon ESUs (70 FR 37160, June 28, 2005) and in the 4(d) Rule for the Puget Sound Steelhead DPS (73 FR 55451, September 25, 2008). The HGMP has been modified since the initial submittal in 2005. The HGMP incorporating elements from unpublished Puyallup River assessments, WRIA 10 Salmon Habitat Limiting Factors Report (Kerwin 1999), Salmon Habitat Protection and Restoration Strategy for WRIA 10 and 12 (Pierce County 2008), Key Peninsula, Gig Harbor, and Islands Watershed Nearshore Salmon Habitat Assessment (Pierce County 2003), future brood document, Comprehensive Management Plan for Puget Sound Chinook: Salmon Hatcheries, and other recent in basin research documents, plus responding to hatchery risk minimization measures recommended by the Hatchery Scientific Review Group through their review of basin hatchery programs (HSRG 2004).

Harvest management of Chinook populations within Puget Sound is implemented through the Comprehensive Management Plan for Puget Sound Chinook - Harvest Management Component (Puget Sound Indian Tribes and WDFW 2010a). Additional court ordered authorizations include the Puget Sound Salmon Management Plan (PSTT and WDFW 1985), Puget Sound Steelhead Harvest Management Plan (PSIT and WDFW 2010b), and the U.S. v Washington "Boldt Decision".

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

Take actions for this program are difficult to quantify. Broodstock is not captured at Diru Creek Hatchery nor is the hatchery program engaged directly with smolt trapping.

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.**

This program does not directly affect listed fish.

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

Puyallup River fall Chinook salmon (*O. tshawytscha)*
The Puyallup River summer/fall Chinook and White River spring Chinook salmon populations are delineated as two of twenty-two independent populations that compose the Puget Sound Chinook salmon ESU (Ruckelshaus et al. 2006). The ESU was listed as threatened under the ESA on March 24, 1999 (64 FR 14308). Chinook salmon originating from the summer/fall Chinook hatchery program and spring Chinook hatchery programs are included as part of the Puget Sound Chinook ESU therefore they are ESA listed with natural-origin Puyallup River Chinook salmon (70 FR 37160, June 28, 2005).

A naturally spawning population of fall Chinook exists primarily within South Prairie Creek. Spawning also occurs to a lesser extent in the mainstem Puyallup River, Carbon River, White River, and their major tributaries. The extent of genetic similarity between hatchery stock and South Prairie Creek natural-spawners needs further examination. GSI samples have been collected within the two groups but analysis is pending fund availability. "In general, Puyallup River fall Chinook enter the river from early June through October, with the peak migration in mid-to late August. Natural spawning begins in early September and is completed by early November, peaking in late September to early October. Typical of most Puget Sound summer/fall Chinook stocks, Puyallup River fall Chinook juveniles out-migrate as subyearlings. The majority of returning adults spawn as 4 yr-olds, with a lesser contribution of 3 year-olds. There are returns of 2 to 5 year-old spawners, but they form a very small portion of the spawning population." (WDFW et al. 2000 *DRAFT*).

White River spring Chinook salmon (*O. tshawytscha)*
White River spring Chinook begin entering the river from May through mid-September. White River Chinook have historically spawned in upper White River tributaries: West Fork White River, lower reaches of Clearwater and Greenwater rivers, and in lower Huckleberry Creek (Salo and Jagielo, 1983). The Buckley trap (RM 24.3) adjacent to Cascade Water Alliance's diversion dam intercepts adult returns. The trap is used for broodstock collection in addition to adults transferred above Mud Mountain Dam to historic natural spawning grounds. Fry emergence is thought to occur in late winter and early spring. After a short rearing period of 3 to 8 weeks the majority of fish migrate to marine waters (WDFW et al. 1996). Hatchery juvenile Chinook releases coincide with the outmigration of natural origin Chinook as evidenced by the simultaneous collections of both hatchery and natural smolts in the White River juvenile trap operated in 2000 and 2001 by WDFW.

Scale sample collections at the ACOE fish trap between RY 2000 and RY 2010 indicate that the proportion of the returning adult NORs that outmigrated as fingerlings ranged from 75% to 100%. The dominant age class was the age 4 returning fish with the average age distribution: Age 2= 8.2%, Age 3= 33.5%, Age 4= 52.4%, and Age 5= 5.8%. Results from the 1998 and 2004-2007 DNA sampling of returning natural origin adult Chinook at the ACOE fish trap indicates a broad return timing of spring type Chinook from May through October. Fall type Chinook overlapped to some degree with spring type with a July peak return for spring Chinook and an August peak return for fall Chinook during the 2004-2007 return years. Ad-clipped fall

Chinook are being excluded from the upper White River to the extent possible. Large numbers of pink and coho salmon prohibit culling of Ad-clipped fall Chinook at the Buckley Trap.

Puyallup River System Steelhead (*O. mykiss)*

The native winter steelhead population is part of the Puget Sound steelhead Distinct Population Segment (DPS), listed as threatened under the ESA on July 11, 2007 (72 FR 26722). The Puget Sound Steelhead Technical Recovery Team (PSSTRT) draft report 'Identified Historical Populations of Steelhead within the Puget Sound Distinct Population Segment' identified 32 historic present demographically independent populations (DIP). These populations were separated into three regions referred to as major population groups (MPG). Eight DIPs were identified in the Central and South Puget Sound Major Population Group all of which are winter run steelhead (PSSTRT 2011). There is some anecdotal information that summer run populations may have existed in some rivers. There are two populations of winter Steelhead in the Puyallup River System, White River and Puyallup/Carbon Rivers. Genetic analysis determined the White River and Carbon River populations to be statistically different from each other using the PSSTRT genetic distance threshold criteria.

The White River population has late run timing with the majority of adults arriving at the Buckley Fish Trap over a 3 month period from March through May. A small number of fish may arrive as early as January and as late as June. The majority of wild White River steelhead spawns in Boise Creek (right bank tributary of the White River just downstream from the Buckley Fish Trap), the Greenwater River, the Clearwater River, and the mainstem below the Buckley Trap (personal communication With Blake Smith). Scale data indicates that most adults return as 4 year olds. However, age 5 adults may be predominant on intermittent return years.

The Puyallup/carbon DIP enter the river in the winter. Spawn timing extends from March to mid-June. The majority of the Carbon River population spawns in South Prairie and Wilkeson Creeks, with small numbers in the mainstem and Voights Creek. Additional spawning occurs in the Upper Puyallup River mainstem including Kapowsin, Fox, Niesson, Kellog, Fennel, Canyon, and Ledout Creek tributaries.

Puget Sound winter steelhead rear in freshwater for the first one to three years before migrating to marine waters. The juveniles migrate rapidly through Puget Sound into the North Pacific Ocean. Adults spend several years in the ocean before returning to their natal stream to spawn. Steelhead spawn in moderate gradient reaches of streams. Steelhead is iteroparious returning to the ocean after spawning to return in subsequence years to repeat spawn.

Puyallup River bull trout (*Salvelinus con fluentus)*

The native bull trout in the coterminous United States were listed as threatened under the ESA on November 1, 1999 64 FR 58910 (USFWS 1999). Puyallup River bull trout occupy a designated Core Area within the Puget Sound Recovery Unit of the Coastal-Puget Sound Distinct Population Segment (DPS) (USFWS 2005). Five local populations have currently been identified for the Puyallup core area: the upper Puyallup and Mowich Rivers; Carbon River; upper White River; West Fork White River; and Greenwater River. There is also an indication a

Clearwater River population may exist (USFWS 2004). Adult bull trout are thought to spawn from late August to mid-October. Bull trout have been observed spawning in Silver Spring and Camp Creek, both tributaries to the White River (Puyallup River tributary). Bull trout have been observed in the lower Puyallup River tidal waters. Anadromous bull trout are thought to forage in Commencement Bay.

Generally, bull trout in this DPS exhibit fluvial, ad fluvial, resident, and anadromous life history strategies. Some adults remain in freshwater their entire lives while others migrate to the estuary. Recent acoustic telemetry tracking studies indicates extensive nearshore movement within Puget Sound where anadromous populations spend up to 5 months each year inhabiting estuarine and nearshore marine waters (Goetz et al. 2003). Studies detect the highest abundance of juveniles near rocks along stream banks or in side channels (Pratt 1992, Goetz 1994). Both resident and anadromous forms spawn in late summer. Bull trout larger than fry size have been found to eat fish half their length (Beauchamp and Van Tassell 2001). Bull trout foraging in Puget Sound feed mainly on Pacific herring, Pacific sandlance, and surf smelt (Goetz et al. 2004).

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**

Puyallup River Chinook salmon (*O. tshawytscha)*
The Puget Sound Chinook Harvest Plan (PSIT and WDFW 2010a) set natural-origin-recruit spawner low abundance threshold of 500 and an upper management threshold of 500 for the Puyallup River fall Chinook. The NMFS refers to a critical threshold of 200 and a viable threshold of 522 for this population in their evaluation of the Harvest Plan (NMFS 2011). White River spring Chinook have low abundance threshold and upper management threshold settings of 200 and 1000, respectively. NMFS determined critical threshold of 200 and a viable threshold of 1,100 for the White River spring Chinook population. The critical threshold is an escapement level below which increases risk of further population decline. The viable threshold is a level of escapement associated with rebuilding to recovery under current conditions. The fall Chinook population appeared to be rebuilding over the last ten years maintaining natural-origin recruit (NOR) escapement levels above viable threshold though fall Chinook NOR escapement dropped in the last three years. The White River spring Chinook counts at the Buckley trap have remained above critical threshold levels over the last twelve years and above the viable threshold three of those years.

Puyallup River Steelhead (*O. mykiss)*
Presently, the PSSTRT released a draft in review document titled 'Viability Criteria for Puget Sound Steelhead' (PSSTRT. 2012). The purpose of the document is to assess the viability of the MPG and DIP segments of the DPS. Viability considerations were based on NOAA's 'viable salmonid population' report (McElhany et al. 2000). These attributes are population size, population growth rate, spatial structure, and diversity. For detailed descriptions of the analyses that generated the values stated below, refer to the document (Hard et al. 2012). In addition, the comanagers developed critical and viable threshold values for annual spawning escapement in

each management unit (MU) as part of the 'Puget Sound Steelhead Management Plan' (PSIT and WDFW 2010b).

The PSSTRT population viability analyses indicate the majority of steelhead populations in the Puget Sound DPS are at moderate to high levels of extinction risk. The extinction risk appears to be especially high for the Central and Southern Sound MPG. The Puyallup/Carbon and White River populations have steadily declined in abundance since the 1980s. Using abundance data series beginning in 1977, the estimated mean population growth rate is 0.931 for the Puyallup/Carbon DIP indicated a declining trend. Although White River winter-run steelhead escapements clearly declined through the early 1990s, the population showed evidence of nearly neutral growth rate at a 0.997 productivity value (PSSTRT 2012). The comanagers developed thresholds for each MU based on theoretical effective population size associated with basin size and number of populations present. Critical thresholds identify a level subject to high risk of extinction and/or loss of genetic integrity. Viable thresholds are a level of abundance associated with a very high probability of persistence for a period of 100 years. Both Puyallup/Carbon and White River populations have critical and viable thresholds set at 250 and greater than a 1000, respectively (PSIT and WDFW 2010b). The PSSTRT may develop thresholds for each DIP in the future.

Puyallup River bull trout (*Salvelinus con fluentus)*

Stock status of Bull trout in the Puyallup River is unknown as no abundance data is been recorded. The only consecutive year data is from the adult trap at the Puget Sound Energy diversion dam at Buckley. In 2000 at the Buckley Trap, the Puyallup Tribe recorded bull trout lengths ranging from 340 millimeters to 560 mm. These lengths are in the range of anadromous bull trout caught in Commencement Bay.

- **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.**

Data not 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.**

Adult Bull Trout Count at the White River Buckley Trap

Year	Trap Count
1987	17
1988	8
1989	14
1990	19
1991	39
1992	38
1993	24
1994	46
1995	15
1996	15
1997	16
1998	44
1999	24
2000	48
2001	39
2002	41
2003	49
2004	45
2005	34
2006	38
2007	44
2008	14
2009	90
2010	84

Source: Salmonscape

Puyallup/White Steelhead (*Oncorhynchus mykiss*):

Table 3. Puyallup River system wild winter steelhead index of escapement since 1990 from WDFW (PSIT and WDFW 2010b).

Year	Carbon River[1]	Puyallup Mainstem[2]	Puyallup/Carbon Total	White River[3]	Lower White River	White River Total
1990	957	285	1,242	545	163	708
1991	895	235	1,130	593	175	768
1992	1,105	175	1,280	837	196	1,033
1993	882	140	1,022	420	154	574
1994	934	190	1,124	349	158	507
1995	1,220	289	1,509	313	324	637
1996	656	172	828	364	176	540
1997	702	290	992	314	82	396
1998	648	115	763	322	118	440
1999	902	174	1,076	252	374	626
2000	496	155	651	382	216	598
2001	358	119	477	420	150	570
2002	248	78	326	519	95	614
2003	235	52	287	162	147	309

2004	410	91	501	184	154	338
2005	98	64	162	153	85	238
2006	323	139	462	163	162	325
2007	418	91	509	303	24	327
2008	355	46	401	207	47	254
2009	190	51	241	165	40	205
2010	398	74	472	522	107	629

[1]Includes escapement from South Prairie, Wilkeson and Voight creeks.
[2]Includes escapements from Neisson, Ladout, Kellogg, Fennel and Canyon Falls, Fox and Kapowsin creeks.
[3]Counts are Buckley trap and haul counts and do not include any escapement in the Lower White River and Boise Creek. Numbers includes brood stock, 26 in 2006, 27 in 2007, 24 in 2008, 19 in 2009, and 20 in 2010. Returning blank wire tag adults from the program are included, 6 in 2008, 31 in 2009, and 298 in 2010.

- **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.**

White River Spring Chinook escapement estimates.

	Chinook above Mud Mountain Dam					Chinook to White River Hatchery		
	NORs (untagged/ unmarked)	Vent Clipped (Acclimation)	Hatchery CWT	Not Sampled	Total to Upper Watershed	Hatchery CWT	NOR brood (untagged/ unmarked)	Total to Hatchery
1998	241	13		1	254	463	0	463
1999	1199	103		3	1302	429	0	429
2000	1499	20		35	1519	740	0	740
2001	2199	25		117	2224	837	0	837
2002	717	121		4	838	665	0	665
2003	1260	300		101	1560	1,010	0	1,010
2004	1747	646		81	2393	963	22	985
2005	1344	756		332	2100	1,568	35	1,603
2006	2042	2662	85	410	4789	1,544	40	1,584
2007	2900	1781	426	2,118	5107	1,688	45	1,733
2008	1402	523	377	600	2380	954	39	1,593
2009	606	263	138	352	1007	997	25	1,761
2010	552	472	130	112	1158	1,085	30	1,115
2011	2737	1045	3		3785			

Source: Puyallup Tribe spreadsheet.

Puyallup River system Fall Chinook natural escapement estimates.

Puyallup basin					South Prairie Creek				
Year	Total	NOR	NOR %	HOR %	Year	Total	NOR	NOR %	HOR %
2002	1,807	1,489	82%	18%	2002	840	570	68%	32%
2003	1,547	758	49%	51%	2003	740	349	47%	53%
2004	1,843	1,047	57%	43%	2004	573	425	74%	26%
2005	1,063	669	63%	37%	2005	389	320	82%	18%
2006	2,232	922	41%	59%	2006	978	550	56%	44%
2007	2,932	1,199	41%	59%	2007	1,194	609	51%	49%
2008	2,725	1,778	65%	35%	2008	925	632	68%	32%
2009	1,526	501	33%	67%	2009	710	140	20%	80%
2010	1,568	483	31%	69%	2010	382	158	41%	59%

Source: Combination of Chinook Harvest Management Plan and HAIP draft corrections and updates.

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.

Hatchery activities listed below were identified in the ESA Section 7 Consultation "Biological Opinion on Artificial Propagation in the Columbia River Basin" (March 29, 1999) as activities where take of listed species could occur.

2.2.3.1 Actions potentially causing direct take of listed fish:

All incidental species are collected in the brood pond and released back into the creek.

Broodstock Collection, Handling, and Holding: Refer to WDFW Voights Creek Coho HGMP.

Broodstock Spawning/Pathology Sampling: Refer to WDFW Voights Creek Coho HGMP.

Rearing Program: NWIFC pathologists screen fish on a monthly basis. Releases of fall Chinook fingerlings into the Puyallup River are consistent with Co-Managers Washington Fish Health Policy (NWIFC and WDFW 2006) to eliminate any disease risk to listed fish populations in the Puyallup watershed.

Operation of Hatchery Facilities: Operation of the hatchery physical plant will have very minor effects on listed fish in the Puyallup River watershed. Withdrawal of surface water and ground water to supply the hatchery is screened to avoid entrainment of juvenile salmon, in accordance with NMFS guidelines (NMFS 1995, 1996). Hatchery effluent may alter

various properties of the receiving water used by listed and other stocks. These properties include suspended solids, settled solids, temperature, dissolved oxygen, biological oxygen demand, and nutrient. This program is operated under discharge limitations set by the U.S. Environmental Protection agency limiting the changes and effects of these properties on the receiving water. Hatchery effluent is rapidly diluted at the point of discharge, and effluent quality is maintained within federal and/or state effluent discharge permit guidelines to ensure that downstream aquatic life (including fish) is adequately protected.

Monitoring Activities: The Puyallup River system adult traps, smolt trap, and other stock status monitoring activities directly associated with the Coho salmon program that lead to fish capture, handling, sampling, and release may adversely affect natural-origin listed salmon and steelhead. Sections 11 and 12 describe the specific monitoring, evaluation and research programs proposed for Puyallup River Coho salmon, and methods applied to minimize incidental effects on listed salmon and steelhead.

2.2.3.2. Actions potentially causing incidental take of listed fish:
The Species Interaction Workgroup (SIWG) formed under the Salmon and Steelhead Conservation and Enhancement Act of 1980 categorized the hatchery salmonid predation and competition risk to natural populations as unknown during freshwater and estuarine life histories. Fresh (1997) noted "Few studies have clearly established the role of competition and predation in anadromous population declines, especially in marine habitats. Flagg et al. (2000) concluded, "By definition, hatchery and wild salmonids will not compete unless they require the same limiting resource.

The timing and lengths of juvenile migrant Chinook salmon, coho salmon, chum salmon, and steelhead originating from natural production have been monitored in the lower Puyallup River at the smolt trap located at river mile 10.6. Wild Chinook start their seaward migration two months prior to the coho hatchery release though peak catches at the trap for Chinook and coho occur in May. Chum migration peaks at the trap in early May. Typically, the majority of steelhead juveniles are caught in May. In early June of 2009, the largest range in length of both wild and acclimation ponds hatchery release Chinook was 67 mm to 118mm. Unmarked yearling coho captured at the trap had a weekly average length range between 80 mm and 116 mm with the weekly average never exceeding 120 mm in 2009. Chum length ranged from 31 mm to 76 mm in May. Natural steelhead outmigrants are applicable in size to the hatchery Coho releases in the basin at an average smolt length of 185 mm (Berger et al. 2009).

Predation: Diru Creek Hatchery coho are released above Electron Dam out of Rushingwater acclimation pond in May at an average length of 135 mm. As mentioned above, salmonid outmigrations are peaking in the lower Puyallup River in May.

Salmonid predation is generally thought to be greatest when the prey is 1/3 or less the length of predator species (USFWS 1994). Assuming the "1/3 size rule" in this instance, the hatchery release is well below the 201 mm, 240 mm, and 555mm plus sizes considered to promote predation on the natural populations of Chinook, coho, and steelhead; respectively. Predation on chum could occur though the impact is probably minimized by the fact that most of the chum migrants have moved into the marine nearshore by May.

Competition / Niche Displacement: Duri Creek Hatchery Coho program may compete with listed Chinook and steelhead for food and space in the freshwater, estuarine, and marine environment through both direct and indirect means. The risk of juvenile competition in freshwater has been minimized by release strategies that promote rapid seaward migration. Early marine life competition between the hatchery and wild juveniles is unknown. Coho and Chinook salmon, after entering the marine environment, generally prey upon fish one-half their length or less and consume, on average, fish prey that is less than one-fifth of their length (Brodeur 1991). The risk of competition by adults from this program has been minimized by operating an integrated program.

Disease Transmission: Hatchery effluent has the potential to transport pathogens from the hatchery water supply to receiving water containing listed and other stocks. Pathogens may also be transmitted by direct contact of infected hatchery fish with other stocks. Although these methods of disease transmission are possible, there is little information showing that pathogens are transferred to naturally produced stocks. This program is operated under the disease prevention and detection guidelines established in the "Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State. These practices should minimize this risk for both listed and other stocks.

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

Voights Creek broodstocking efforts could include take of listed fish. Refer to Voights Creek Coho HGMP.

- **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).**

Not applicable. Broodstock not collected at Diru Creek, smolt trapping will occur in the lower Puyallup River at RM 10.5, but is not directly associated with the operation of the Diru Creek Hatchery program.

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

Not applicable

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 Puyallup River watershed recovery and restoration plans will be operated consistent with the guidelines being developed by the co-managers in the Comprehensive Chinook Management Plan, the Puget Sound Salmon Management Plan, and the Puget Sound ESU-wide hatchery plan.

This HMGP is consistent with hatchery program guidelines stated in the co-managers' Puget Sound hatchery resource management plan (WDFW and PSTT 2004), and is consistent with the following policies and permit requirements that are relevant to hatchery program management:

3.1.1. *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).

3.1.2. *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).

3.1.3. *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).

3.1.4. *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 (NWIFC and WDFW 1998, 2006).

3.1.5. *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.

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 operates under and is consistent with several court orders and agreements. These include U.S. v. Washington Boldt decision, and subsequent orders including the Puget Sound Salmon Management Plan (PSSMP), Comprehensive Management Plan for Puget Sound Chinook: Hatchery Management and Harvest Management components, and US/Canada Salmon Treaty - Indicator Stock Program.

The PSSMP requires that WDFW and Puget Sound tribe develop Equilibrium Broodstock Documents agreeing on program goals, objectives, function, and release strategies of all hatchery programs. These Future Brood Documents are 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.

The hatchery resource management plan (WDFW and PSTT 2004) identifies interim goals for hatcheries. The plan describes operating procedures for Chinook salmon hatcheries in Puget Sound and their role in achieving the comanagers' resource management goals. Both tribal and WDFW hatcheries are covered describing benefits and risks to protecting ESA listed Puget Sound Chinook.

The Puyallup Tribe entered into a Resource Enhancement Agreement (REA) with Puget Sound Energy (PSE) in 1997. Through the agreement, funds are allocated to begin fish restoration efforts. The Puyallup Tribe is currently in the design process to construct a fish ladder at the dam. The fish ladder became operational in the fall of 2000. The agreement also stipulates minimum in-stream flow requirements for migrating adults in the Electron Dam project area (WDFW et al. 2000 *DRAFT*).

The agreement also stipulates minimum in-stream flow requirements for migrating adults in the Electron Dam project area. Under the REA, PSE will provide 60 cfs year-round in the bypass reach. This will increase to 80 cfs during the four month period from July 15-November 15 to facilitate adult salmon migrating upstream.
(WDFW et al. 2000)

3.3) Relationship to harvest objectives.

South Puget Sound coho are managed for hatchery production and harvest directed at hatchery produced coho. Puyallup River fisheries will be managed to achieve escapement to hatchery facilities to support hatchery production goals.

The reintroduction program upstream of Electron Dam is an integrated recovery program receiving juvenile coho at 30 fish-per pound from the Voights Creek Hatchery for imprinting and release out of Rushingwater acclimation pond. All coho released are adipose-fin-clipped and/or

coded-wire-tagged. The program goal is to re-establish a viable coho salmon run in the 30 miles of usable salmonid habitat above Electron Dam.

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.

Limited coded-wire-tag recoveries (CWT) indicate the Acclimation Ponds coho integrated recovery program contribute to Puget Sound terminal net fisheries. The table below shows a summary of CWT recoveries to all fisheries for combined brood years 2003, 2004, 2005 with respective CWT releases of 55,575, 102,347, and 80,200.

CWT Recovery Distribution for Puyallup River Acclimation Pond Coho Releases for Combined Brood Years 2003, 2004, and 2005

Recovery Location	Number of Obs. Recoveries	Number of Est. Recoveries	% of Total Est. Recoveries
West Coast Vancouver Island Sport	6	81.3	2.4%
Georgia/Juan de Fuca/Johnstone Str. Sport	9	62.9	1.9%
WA Areas 4 and 4B Troll (Cape Flattery)	23	62.1	1.9%
WA Area 4 Sport (Neah Bay)	16	47.7	1.4%
WA Area 3 Troll (Quileute)	6	9.0	0.3%
WA Area 3 Sport (La Push)	5	8.1	0.2%
WA Area 2 Sport (Westport)	23	61.6	1.8%
WA Area 1 Sport (Illwaco)	6	10.1	0.3%
Tillamook Sport	1	2.3	0.1%
Newport Sport	1	3.1	0.1%
WA Area 5 Sport	68	311.2	9.3%
WA Area 6 Sport	2	10.3	0.3%
Juan de Fuca Net (WA Areas 4B,5,6,6A,6C)	2	3.7	0.1%
WA Area 8-2 Sport (Stillaguamish-Snohomish)	3	13.7	0.4%
Stillaguamish/Snohomish Net (WA Area 8)	1	1.0	0.0%
WA Area 9 Sport (Discovery-Admiralty)	18	95.3	2.9%
WA Area 9A Net (Port Gamble Bay)	1	2.0	0.1%
WA Area 10 Sport (Seattle-Bainbridge)	36	116.3	3.5%
WA Area 11 Sport (Tacoma-Vashon)	46	192.0	5.7%
WA Area 10 Net	4	4.8	0.1%
WA Area 10A Net	1	5.6	0.2%
Quilcene Bay Net (WA Area 12A)	1	3.6	0.1%
Freshwater Net	593	2,173.2	65.0%
Freshwater Escapement	187	61.7	1.8%
Total Recoveries	1,058	3,341.6	100.0%

Source: RMIS 12-10-12

No recent tag recoveries are available related to the re-established Kapowsin Lake Net Pens releases. The table below shows a summary of CWT recoveries to all fisheries for combined brood years 1993, 1994, 1995 with respective CWT releases of 49985; 49,147; and 49,783. Again these releases indicate a substantial contribution to Puget Sound terminal fisheries. Overall fisheries may show a different distribution due to present changes fishery regimes. Table does not include age-2 estimated recoveries of 4 freshwater sport and 10.5 escapement.

CWT Recovery Distribution for Puyallup River Kapowsin Lake Net Pens Coho Releases for Combined Brood Years 1993, 1994, and 1995

Recovery Location	Number of Obs. Recoveries	Number of Est. Recoveries	% of Total Est. Recoveries
Southeast Alaska Troll	1	3.8	0.1%
NW Vancouver Island Troll	21	77.6	2.2%
SW Vancouver Island Troll	209	805.0	22.9%
West Coast Vancouver Island Sport	5	51.9	1.5%
Georgia/Juan de Fuca/Johnstone Str. Sport	22	202.6	5.8%
Juan de Fuca Net (Canadian Area 20)	5	11.4	0.3%
WA Areas 4 and 4B Troll (Cape Flattery)	20	55.6	1.6%
WA Area 4 Sport (Neah Bay)	22	44.3	1.3%
WA Area 3 Troll (Quileute)	1	1.2	0.0%
WA Area 3 Sport (La Push)	3	4.0	0.1%
WA Area 2 Sport (Westport)	12	21.5	0.6%
WA Area 1 Sport (Illwaco)	12	21.9	0.6%
WA Area 7 Sport	6	41.3	1.2%
San Juan Net (WA Areas 7 and 7A)	2	2.0	0.1%
WA Area 5 Sport	92	402.2	11.5%
WA Area 6 Sport	29	138.2	3.9%
WA Area 8 or 8-1 Sport (Skagit)	1	8.8	0.3%
Skagit Marine Net (WA Area 8)	1	3.4	0.1%
WA Area 8-2 Sport (Stillaguamish-Snohomish)	6	28.2	0.8%
WA Area 9 Sport (Discovery-Admiralty)	16	82.1	2.3%
WA Area 10 Sport (Seattle-Bainbridge)	36	170.1	4.8%
WA Area 11 Sport (Tacoma-Vashon)	53	347.4	9.9%
WA Area 10 Net	17	18.2	0.5%
WA Area 10A Net	4	4.5	0.1%
WA Area 11 Net	1	1.0	0.0%
WA Area 13 Sport (South Sound)	2	23.6	0.7%
WA Area 13C Net	1	10.5	0.3%
WA Area 13D Net	2	4.5	0.1%
Freshwater Sport	3	12.0	0.3%
Freshwater Net	257	761.6	21.7%
Freshwater Escapement	144	147.5	4.2%
Total Recoveries	1,006	3,507.9	100.0%

Source: RMIS 12-10-12

3.4) Relationship to habitat protection and recovery strategies.

A number of anthropogenic factors have affected fish habitat throughout the Puyallup Basin. Beginning in the late 1800's timber production began resulting bank stability problems and increased sediment loads. Habitat has also been affected by flood control activities, which have included removal of riparian vegetation, removal of large woody debris from the river channel, levee construction, gravel removal and channelization. Remedies are currently under way to mitigate some past land management practices. One such practice is land acquisitions for the construction of set-back. The increase sinuosity created by the use the setback levies should aid in gravel and woody debris recruitment processes creating more suitable spawning habitat for adults and more refugia for rearing and outmigrating juveniles.

"The lower Puyallup River, below its confluence with the White River, and Commencement Bay estuary has both been heavily impacted by residential and commercial development. Commencement Bay has been heavily influenced by industrial uses. In 1982, the federal government ranked the Commencement Bay amongst the most hazardous waste sites in the U.S.. Restoration efforts are currently underway which are managed by the Natural Resource Damage Trustees. The trustees include NOAA, USFWS, DOE, DNR, WDFW, and the Puyallup and Muckleshoot Indian Tribes (WDFW et al. 2000).

The upper Puyallup Basin has been void of anadromous fish production since the construction of the Electron Dam in 1903. Under the Resource Enhancement Agreement the Puyallup Tribe and Puget Sound Energy have been working together to construct a fish ladder. The fish ladder became operational in August 2000.

3.5) Ecological interactions.

Hatchery fish can interact with listed fish species through competition and predation (Fresh 1997). Program fish can negatively impact listed fish populations through reduced growth, survival and abundance. Several methods have been developed to assess potential negative ecological interactions and risks associated with hatchery programs (Pearsons and Hopley 1999; Ham and Pearsons 2001). The degree to which fish interact depends upon fish life-history characteristics which include: 1) size and morphology, 2) behavior, 3) habitat use and 4) movements (Flagg et al. 2000). Important considerations associated with hatchery practices include the type of species reared, fish size at time of release, number of fish released and location(s) of program releases. Interaction potential between hatchery origin fish and natural origin fish can certainly depend on habitat structure and system productivity. For example, habitat structure can influence predator-prey encounter rates (visibility), the amount of preferred spawning habitat and fish susceptibility to flushing flows. System productivity determines the degree to which fish populations may be food-limited, and thus negatively impacted by density-dependent effects. The type and degree of risk associated with releases of program fish typically involve complex mechanisms. Actual identification and magnitude of causal mechanisms negatively impacting listed fish is not always definitive due to confounding factors such as human-induced environmental changes, indirect pathway effects and the diversity of environments salmon occupy throughout their life-cycle (Li et al. 1987; Fausch 1988; Fresh 1997; Flagg et al. 2000). Given these complex mechanisms and site-specific considerations it is not surprising that for most hatchery programs, the extent of possible adverse competition and predation effects of hatchery releases on listed fish populations throughout Puget Sound have not been explicitly documented or quantified.

3.5.1. *Salmonid and non-salmonid fishes or other species that could negatively impact the program.*

Several researchers have documented increased predation by birds, mammals and other fish on both hatchery and natural rearing salmon, due to the increased concentration of recently released hatchery outmigrants (Allendorf et al.1997; Wood.1987a,b).

Predation and competition related effects are generally mitigated by niche separation among

species, and the size and abundance of potential predators. Steelhead may pose a predation risk to Coho smolts in freshwater. Steelhead outmigrants leave the nearshore and coastal waters rapidly spending two or three years feeding in the Pacific Ocean (Moore et al. 2010). Anadromous cutthroat tend to remain in estuaries and nearshore waters. Juvenile salmon predation studies in Puget Sound indicate cutthroat trout primarily prey on juvenile salmon between April and June. During this time period, pink and chum salmon contributed the greatest number of salmon with Coho prey detected in May samples (Duffy and Beauchamp 2008). Bull trout migrate and forage in the marine nearshore of Puget Sound (Goetz et al. 2003, 2004).

Avian predators including terns (*genus Sterna and several sub-species),* gulls (*genus Larus and several subspecies),* mergansers (*Mergus merganser),* double crested cormorants *(Phalacrocorax auritus),* belted kingfishers *(Ceryle alcyon),* great blue herons *(Ardea herodias)* and green herons *(Butorides virescens)* can also prey on juvenile Chinook salmon. Western Grebes consume salmon though the concern is minimal considering the population of this bird species has declined in recent years (Nysewander per. com. 1999). Great Blue Herons are territorial and appear to be a nuisance at hatchery ponds. A feeding ecology study of marine cormorants covering the Alaska coast to California showed double-crested cormorants fed on schooling fish and salmonids while Pelagic and Brandt's cormorants preferred solitary benthic fish (Ainley et al. 1981). The Vancouver Island studies by Wood (1987a, 1987b) best demonstrate the forging behavior of Common mergansers. In the investigation, these birds ate juvenile salmonids almost exclusively when forging on freshwater reaches of a stream whereas the individuals forging on the tidal waters rarely ate salmonids. Seasonal consumption estimates of 80K to 131K Coho fry were calculated for the Big Qualicum River.

In the North Pacific, approximately fifteen species of marine mammals reportedly eat salmon. Predation on salmon smolts and adults in lower rivers, estuary, and marine near-shore have been documented in beluga whales, harbor porpoise, larga seal, stellar sea lion, California sea lion, and harbor seal. The Killer whale consumes free-swimming adult salmon in these habitats, also. In addition mink and river otter forage on salmonids in the freshwater and marine shoreline.

California sea lions, and Pacific harbor seals are opportunistic feeders that consume a proportion of salmonids in their diet. The populations of these species have increased along the California, Oregon, and Washington coast at approximately 5% annually since the mid-1970s (NMFS 1997). Harbor seals have been documented by several researchers to capture and consume both adult and juvenile salmonids including chum fry (NMFS, 1997). A recent harbor seal diet study in the San Juan Island archipelago examined prey species composition in scat samples (Lance and Jeffries 2007). Adult salmonids represented 19% of the overall prey species identified. Coho adults and juveniles were identified prey items in the scat samples. There are several haul out sites on buoys and log booms in Commencement Bay (Jefferies et al. 2000).

The major dietary prey item for resident killer whales in the northeastern Pacific appear to be Chinook salmon. Salmon were found to represent 97% of prey for the Northern Resident killer whale population and Chinook salmon comprised 69% of identified prey. Less dietary information exists for the Southern Resident killer whales though known feeding record suggest that diet resembles their northern cousins (Hanson et al. 2005, Ford and Ellis 2005, 2006).

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

Releases of yearling Coho salmon certainly pose a predation risk on juvenile fall Chinook and chum salmon, both in the freshwater and marine environment (Hargreaves and LeBrasseur 1985; Hawkins and Tipping 1999; Pearsons and Fritts 1999). Actual rates of predation by program releases of yearling Coho salmon on juvenile Chinook and chum salmon are unknown at this time. Given the perceived risks associated with hatchery programs, hatchery coho salmon are reared and released in a manner to minimize potential negative impacts on listed Chinook salmon, steelhead and bull trout populations. As mentioned in section 2, the Hatchery Coho program should have minimal negative effect on listed salmonids with the present management plan. It is anticipated the program would have a positive impact to avian and mammal species.

3.5.3. *Salmonid and non-salmonid fishes or other species that could positively impacted the program*

The Hatchery Coho program would benefit from an overall healthy freshwater ecosystem. The input of marine derived nutrients from anadromous salmonid spawned carcasses from natural production and other existing hatchery programs in the basin will enhance the ecological processes. The benefits of these nutrient inputs are discussed in the section 3.5.4.

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

The Hatchery Coho program will supply a source of marine derived nutrients to the watershed benefiting numerous fish, bird, mammal, invertebrate, and plant species. Nutrients will be provided by decaying hatchery return carcasses decaying from HORs on the spawning grounds and the nutrient enrichment program that distributes sampled hatchery return carcasses throughout the basin. Carcasses from returning adult salmonids have been found to elevate stream productivity through several pathways, including: 1) release of nutrients from decaying carcasses that directly stimulates primary productivity (Wipfli et al. 1998); 2) enrichment of the food base of aquatic invertebrates by decaying carcasses (Mathisen et al. 1988); and 3) direct feeding on carcasses by juvenile salmonids (Bilby et al. 1996). Bilby and Bisson (1987) have documented the positive correlations between increased freshwater productivity and increases in salmon spawning biomass and nutrient transfers. Increasing populations of other salmon species will provide additional primary productivity that may benefit both hatchery and natural Coho fry and outmigrants. In addition, marine derived nutrients are distributed throughout the riparian zone by foraging animals.

The Coho program could positively impact freshwater and marine species that prey on juvenile salmon as mentioned earlier with cutthroat trout. The hatchery releases will also provide forage for avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons. Mammals that benefit from migrating fingerlings and adults include river otters, harbor seals, sea lions and orcas.

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.

Diru Creek hatchery water is supplied from two wells supplying 800 gpm (combined). An additional 200 gpm is available as surface water gravity fed from Diru Creek.

Water is surface water that is gravity fed to the Rushingwater and Cowskull acclimation ponds at an average flow of 896 gpm with a 0.51 exchange per hour. Average pond temperature ranges from 39 to 54 F. Dissolved oxygen is approximately 12 ppm. Lake Kapowsin water temperatures range from 48 to 52 F.

Department of Ecology permit for water withdrawal is G2-25820.

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.

The hatchery water intake structure is in compliance with NOAA Fisheries screening criteria (NMFS 1995, 1996).

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Broodstock for this program are collected at Voights Creek Hatchery (See Voights Creek HGMP).

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

Fish transportation equipment consists of three 600-gallon capacity tanks each is supplied with supplemental oxygen and aeration. (Blake Smith pers. comm.)

5.3) Broodstock holding and spawning facilities.

See Voights Creek HGMP.

5.4) Incubation facilities.

Incubation occurs at Voights Creek Hatchery.

Rearing facilities.

Initial rearing occurs at Voights Creek Hatchery.

5.5) Acclimation/release facilities.

The Coho Acclimation Program typically receives 100k yearlings received from Voights Creek's egg take. All 100k is released from acclimation sites above Electron Dam.

Description of acclimation ponds

Unit	Cubic Feet	Flow *	Exchange/HR
Mowich	14,000	1300 gpm	.74
Cow Skull	10,000	896 gpm	.72
Rushingwater	12,000	2050	1.4

*= Average flow
Acclimation pond temperatures range from 39-54 F
DO approximately12 ppm

Net pen program consists of four net pens with 9,000 cu. ft. or rearing space each.

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

Water flows to the raceways at Voight Creek Hatchery interrupted when gravity intake became plugged killing 100,000 coho yearlings in the Spring of 1999.

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.

Hatchery has a low water alarm installed, linked via pager to hatchery staff. Also installed on-site is a back-up diesel powered generator capable of supplying a 170 kW in the event of an electrical failure.

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.

Reference Voights Creek HGMP for this information. No broodstock is collected on-station.

6.2) Supporting information.

- **6.2.1) History.**
- **6.2.2) Annual size.**
- **6.2.3) Past and proposed level of natural fish in broodstock**.
- **6.2.4) Genetic or ecological differences**.
- **6.2.5) Reasons for choosing.**

See Voights Creek HGMP

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.

See Voights Creek HGMP

SECTION 7. BROODSTOCK COLLECTION

Broodstock are collected at Voights Creek Hatchery (See Voights Creek HGMP)

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

Not applicable

7.2) Collection or sampling design.

Not applicable

7.3) Identity.

Voights Creek Stock

7.4) Proposed number to be collected:
Not applicable

7.4.1) Program goal (assuming 1:1 sex ratio for adults):
Not applicable

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:
Not applicable

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.
Not applicable

7.6) Fish transportation and holding methods.
Not applicable

7.7) Describe fish health maintenance and sanitation procedures applied.
Not applicable

7.8) Disposition of carcasses.
Not applicable

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.

Not applicable

SECTION 8. MATING

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

Matings occur at Voights Creek hatchery; see Voights Creek fall chinook HGMP for specific mating protocols.

8.1) Selection method.

Not applicable

8.2) Males.

Not applicable

8.3) Fertilization.

Not applicable

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.

Not applicable

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.
Voights Creek Hatchery HGMP

9.1.2) Cause for, and disposition of surplus egg takes.
No excess eggs available

9.1.3) Loading densities applied during incubation.
See Voights Creek HGMP

9.1.4) Incubation conditions.
See Voights Creek HGMP

9.1.5) Ponding.
See Voights Creek HGMP

9.1.6) Fish health maintenance and monitoring.
See Voights Creek HGMP

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.

Not applicable, hatchery stock is not listed.

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 data on hatchery fish is available and is calculated from stage received at facility through time of release. Fish are received at yearling stage and released when smolting.

Brood Year	% Survival	Stage Received	Comments
1996	89.2	Yearling	WDFW overloaded transfer truck
1997	99.9	Yearling	
1998	50.7	Yearling	Plugged intake at Voight Creek Hatchery

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

Include density targets (lbs fish/gpm, lbs fish/ft3 rearing volume, etc).

Rearing densities dependent on fish size

Fall Coho
Cowskull Pond

Date	# of Fish	#/pound	lbs/cu ft	lbs/gpm	Length	C.F.	Flow
06-Feb-98	90,000	32	0.27	4.19			672gpm
09-Apr-98	90,000	22	0.39	6.09			672gpm

Fall Coho

Date	# of Fish	Rearing Location	Rearing Capacity	Flow	Fish/pound	Lbs/gpm	Lbs/cu. ft.	temp	Biomass
27-Jan-99	**50,000**	**Mowich**	**7,500**	**151**	**37**	**8.94**	**0.18**	**39**	**1,351**
27-Jan-99	**150,000**	**Rushingwater**	**12,000**	**2050**	**37**	**1.98**	**0.33**	**40**	**4,054**
22-Apr-99	**49,850**	**Mowich**	**7,500**	**150**	**28**	**11.8**	**0.23**	**42**	**1,780**
25-May-99	**149,970**	**Rushingwater**	**12,000**	**2050**	**22**	**3.33**	**0.57**	**42**	**6,817**

Fall Coho
Rushingwater Pond

Date	# of Fish	#/pound	Lbs/cu. ft.	Lbs/gpm	flow	temp
26-Jan-00	105,000	32	0.27	1.60	2050gpm	36
10-Mar-00	104,500	32	0.27	1.60	2050	36
08-May-00	104,400	23.6	0.37	2.16	2050	42
19-May-00	101,400	22.3	0.38	2.22	2050	44

500-1000 fpp .5 lb/ft^3/in, 2 lbs/gpm (maximum threshold)

17-500 fpp .5 lb/ft^3/in, 6 lbs/gpm (maximum threshold)

Lake Kapowsin Net Pen

Date	# of Fish	#/pound	lbs/cu.ft.	temp.
18-Apr-94	50,059	17.5	0.32	52F

9.2.3) Fish rearing conditions

Description of acclimation ponds

Unit	Cubic Feet	Flow *	Exchange/HR
Mowich	14,000	1300 gpm	.74
Cow Skull	10,000	896 gpm	.72
Rushingwater	12,000	2050	1.4

*= Average flow
Acclimation pond temperatures range from 39-54 F
DO approximately12 ppm

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.

See Attachment 10.

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

Data 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*).

Acclimation ponds and Net -Pens
Feeding is achieved by automatic AF3A Sweeny scatter feeders with 6 separate feeding intervals between 1 to 2 percent body weight per day of Biovita based on temperature and size of fish.

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

Each year, fish pathologists screen a representative number of adults returning to tribal hatcheries for pathogens that may be transmitted to the progeny. The exact number of fish to be tested from each stock is specified in the Co-managers Salmonid Control Policy. Pathologists work with hatchery crews to help avoid pre-spawning mortality of broodfish to maximize fertilization and egg survival.

Preventative care is also promoted through routine juvenile fish health monitoring. Pathologists conduct fish health exams at each of the tribal hatcheries on a monthly basis from the time juveniles' swim-up until they are released as smolts. Monthly monitoring exams include an evaluation of rearing conditions as well as lethal sampling of small numbers of juvenile fish to assess the health status of the population and to detect pathogens of concern. Results are reported to hatchery managers along with any recommendations for improving or maintaining fish health. Vaccine produced by the TFHP may be used when appropriate to prevent the onset of two bacterial diseases (vibriosis or enteric redmouth disease). In the event of disease epizootics or elevated mortality in a stock, fish pathologists are available to diagnose problems and provide treatment recommendations. Pathologists work with hatchery crews to ensure the proper use of drugs and chemicals for treatment. The entire health history for each hatchery stock is maintained in a relational database called AquaDoc. (Northwest Indian Fisheries Commission Fish Pathology pers.comm.)

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

Not applicable

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

Both acclimation ponds have natural rock bottoms with root wads placed in the ponds.

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.**

Fish will be reared to sub-yearling smolt size to mimic the natural fish emigration strategy and are released volitionally.

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
Yearling	100,000	28-18 fpp	Late April-Mid May	Acclimation
Yearling	200,000	16-18 fpp	Late April- Mid May	Net-Pens

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

Stream, river, or watercourse: Lake Kapowsin, Cowskull Creek, and Rushingwater Creek.
Release point: Net-pen site, Acclimation ponds
Major watershed: Puyallup River
Basin or Region: WRIA 10.0021

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

http://rmpc.org/

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

Acclimation pond fish are released volitionally. Net-pen fish are forced released.

http://www.rmpc.org/

10.5) Fish transportation procedures, if applicable.

Fish are transported via oxygen supplemented tanker truck, container volumes for each of the three tanks is 600 gallons. The transit time to the acclimation sites is about 1 hour and Lake Kapowsin is 30 minutes.

10.6) Acclimation procedures.

Fish are transported in late January to acclimation sites and Lake Kapowsin where they are acclimated for approximately 4 months.

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

hatchery adults.

Hatchery population is 50% CWT and 100% adipose fin clipped for acclimation pond and net-pen releases.

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

Not applicable

10.9) Fish health certification procedures applied pre-release.

Fish health is monitored monthly by Northwest Indian Fisheries Commission Fish Health Staff.

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

In the event of catastrophic water failure fish would be released early. (Blake Smith, pers. comm.)

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.

Given the perceived risks associated with hatchery programs (see Section 3.5), hatchery coho salmon are reared and released in a manner to minimize potential negative impacts on listed chinook salmon and bull trout populations. These measures include:

Coho smolts are released at smoltification to promote rapid outmigration in the freshwater and nearshore marine environment.

Acclimation pond rearing is aimed at mimicking characteristics of 'wild juvenile fish.

Voights Creek Hatchery has reduced coho smolt releases by 400,000 fish.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

Monitoring and evaluation plan is currently being developed

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.

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

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.

SECTION 12. RESEARCH

12.1) Objective or purpose.

Coho smolts are marked with ad/cwt determine survival rates of the program and compare them with cwt coho smolts released from Voights Creek Hatchery

12.2) **Cooperating and funding agencies**.

Puyallup Tribe of Indians and WDFW. Program funded by the Puyallup Tribe.

12.3) Principle investigator or project supervisor and staff.

Principle investigators: Blake E. Smith, Enhancement Chief; Russell C. Ladley, Environmental Protection Manager.

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.

Adults ascending Electron Dam will be trapped in the fish ladder and visually sampled for external marks. A cwt wand will be used to detect cwt presence. Spawning ground surveys in tributaries below the dam and above plus the Lake Kapowsin tributaries will be sampled for marked coho adults. All Puyallup Tribal fisheries will be marked sampled.

12.6) Dates or time period in which research activity occurs.
Adult coho are recovered in all sampled fisheries and on the spawning grounds.

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

12.8) Expected type and effects of take and potential for injury or mortality.
No take is occurring to listed species during sampling.

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).
Zero**.**

12.10) Alternative methods to achieve project objectives.
None.

12.11) List species similar or related to the threatened species; provide number and causes

of mortality related to this research project.
Coho: At time of tagging, and transportation to acclimation ponds. Mortality is less than 1%.

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.

No adverse ecological effects, injury, or mortality to listed fish will occur during this research activity except as mentioned under Section 3.5

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

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

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

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

Listed species affected: Fall and Spring Chinook, Steelhead, Bull Trout ESU/Population: Puyallup Watershed Activity: Coho Rearing				
Location of hatchery activity: Acclimation Ponds, Net-Pens Dates of activity: February to April Hatchery program operator: Puyallup Tribe				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)	0	0	0	0
Collect for transport b)	0	0	0	0
Capture, handle, and release c)	0	0	0	0
Capture, handle, tag/mark/tissue sample, and release d)	0	0	0	0
Removal (e.g. broodstock) e)	0	0	0	0
Intentional lethal take f)	0	0	0	0
Unintentional lethal take g)	0	0	0	0
Other Take (specify) h)	0	0	0	0

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

Instructions:

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