HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	White River Hatchery
Species or Hatchery Stock:	Spring Chinook, White River
Agency/Operator:	Muckleshoot Indian Tribe
Watershed and Region:	Puyallup Basin/White River, Puget Sound
Date Submitted:	
Date Last Updated:	December 3, 2014

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

White River Hatchery Spring Chinook Program

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

White River Spring Chinook, *Oncorhynchus tshawytscha*, Listed as Threatened (March 1999). Re-affirmed Threatened by five-year status review, completed August 15, 2011 (76FR50448).

1.3) Responsible organization and individuals.

Hatchery Operations Staff Lead Contact

Name (and title):	Dennis Moore, Enhancement Manager
Agency or Tribe:	Muckleshoot Tribe
Address:	25315 S.E. Mud Mountain Road, Enumclaw, WA 98022
Telephone:	(253) 876-3286
Fax:	(360) 825-1686
Email:	dennis.moore@muckleshoot.nsn.us

Acclimation Pond Facility Operations Contact

Name (and title):	Blake E. Smith, Enhancement Program Manager
Agency or Tribe:	Puyallup Tribe of Indians
Address:	6824 Pioneer Way E., Puyallup, WA. 98371
Telephone:	253-680-5561
Fax:	253-680-5575
Email:	blake.smith@puyalluptribe.com

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

The Washington Department of Fish and Wildlife (WDFW) rears supplemental White River spring Chinook at Hupp Springs Facility and its Puyallup Hatchery. The U.S. Army Corp of Engineers (USACE) operates the Buckley Fish Trap at River Mile 24.3 to collect and transport adult salmonids above Mud Mountain Dam. The Muckleshoot Indian Tribe (MIT) receives a portion of the White River Hatchery program broodstock from the Buckley Fish Trap located on the left bank opposite the hatchery. WDFW, Puyallup Tribe of Indians (PTI), MIT, NOAA, Northwest Indian Fisheries Commission, and the U.S. Forest Service participate in the South Sound Spring Chinook Technical Committee that provides coordination and technical assistance for White River spring Chinook production.

1.4) Funding source, staffing level, and annual hatchery program operational costs.
Tribal and BIA /4-15 staff / O&M $798,000, not including acclimation costs.

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

White River Hatchery is located on the White River (right bank) at River Mile 23.4 (10.0031), Puyallup River Basin, Washington State. The acclimation ponds are managed by the Puyallup Tribe of Indians. Egg transfers for acclimation pond releases will occur at Diru Creek (PTI) and at the Puyallup Hatchery (WDFW). A potential future supplemental rearing facility may be constructed on Coal Creek Springs, a tributary to the White River near River Mile 10.0 (left bank).

Acclimation Pond Sites in the Upper White River Watershed above Mud Mountain Dam:
The Huckleberry Creek ("Army") Rearing Pond is located at Mile 0.5 on Huckleberry Creek (10.0253), Puyallup/White River basin, Washington State.

The Huckleberry Creek ("Aerial") Rearing Pond is located at Mile 4.8 on Huckleberry Creek (10.0253), Puyallup/White River Basin, Washington State.

The Greenwater Rearing Pond is located at RM 11.2 on the Greenwater River (10.0122), Puyallup/ White River Basin, Washington State.

The Cripple Creek Rearing Pond is located at RM 0.3 on the Cripple Creek (10.0086), Puyallup/White River Basin, Washington State. *Note*: This pond is currently non-operational due to flood damages.

The Jensen Creek Rearing Pond is located at RM 2.3 on the Jensen Creek (10.0082), Puyallup/White River Basin, Washington State.

Twenty-eight Mile Creek Pond (10.0129) on Twenty-eight Mile Creek at River Mile 0.2, tributary to the Greenwater River, Puyallup/ White River Basin, Washington State. (Operation pending completion of a land use permitting process).

1.6) Type of program.

Integrated Recovery

1.7) Purpose (Goal) of program.

The goal of this program is the restoration of spring Chinook salmon in the White River using the indigenous stock.

Note: The Muckleshoot Indian Tribe reserves the right to discontinue current production; modify the current production level; or change species and/or production level reared to meet the needs and policy direction of the Tribe, in consultation with their co-manager, and with the appropriate federal agencies to ensure ESA compliance.

1.8) Justification for the program.

The hatchery program will conserve the genetic identity of the indigenous stock and help restore the abundance and distribution of spring Chinook in the White River watershed. Prior to hatchery intervention, the natural escapement had declined to about 50 in the White River in 1977 (MIT, PTI and WDFW, 1996). The White River hatchery program is recognized as vitally important in the White River system (Shared Strategy 2005). Both the naturally-spawning and the hatchery spring Chinook are included in the listing of the White River spring Chinook stock as a threatened species in the Puget Sound Chinook listing (64 FR 14308, March 24, 1999).

The goal of this program is to help restore indigenous spring Chinook salmon in the White River to levels providing sufficient harvest opportunity. Salmon harvest is essential to the culture and well-being of the Muckleshoot Indian Tribe. The harvest of fish under this program is an essential part of the Tribe's federally-recognized treaty fishing rights reserved in the Treaties of Medicine Creek and Point Elliott. The role of this and other hatchery programs associated with treaty-reserved fishing rights is to support four basic values recognized by the Federal courts: (1) resource conservation, (2) ceremonial, religious, and spiritual values, (3) subsistence values, and (4) commercial values.

The natural production of spring Chinook in the White River watershed has been diminished by the extensive loss and degradation of habitat. Mud Mountain Dam was completed in 1948 by the US Army Corps of Engineers to provide flood control for cities along the lower White and Puyallup Rivers. It is a complete barrier to salmon migration, and dam construction and operation has numerous other adverse effects on salmon production potential both upstream and downstream of the dam including elimination of spawning habitat in the dam inundation zone, and alteration of the natural flow and sediment regime. A trap and haul is operated by the Corps at Buckley, however, these facilities are unsafe and inadequate. The lower White River downstream of the Muckleshoot Indian Reservation and lower Puyallup River are largely confined by levees and revetments. The former estuary in Commencement Bay is an industrialized and contaminated port. So long as watersheds are unable to maintain self-sustaining and abundant salmonid populations, hatchery programs will be needed to replace lost natural production and provide meaningful harvest opportunity in fulfillment of promises made in the Treaties and the Muckleshoot Indian Tribe's treaty fishing rights affirmed by the U.S. v. Washington proceedings.

1.9) List of program "Performance Standards".
See Section 1.10

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

Table 1.10.1. Performance Standards, Indicators, and Monitoring addressing benefits.

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Hatchery operations support Puget Sound Salmon Management Plan (US v Washington) and sustain Muckleshoot tribal fisheries guaranteed through the Treaties of Point Elliott and Medicine Creek.	Population maintaining viable interim threshold of 1,000 natural origin spawners passed upstream of Mud Mountain Dam. Natural origin spawners increase over time consistent with habitat carrying capacity and replacement of the Fish Trap operated by the USCOE.	White River Hatchery and USACE Buckley trap counts, escapement (redd count) surveys below trap, mark identification, and scale samples for age composition to assess abundance and productivity. Comprehensive monitoring of this indicator and accurate run reconstruction will require replacement of the existing 1940s-era fish trap with improved sorting, sampling, and capacity.
	Releases above Mud Mountain Dam and on-station releases are increasing natural production.	NOR, CWT, and ventral fin-clip counts at Buckley trap plus trap records of fish hauled above trap. HOR contribution to spawning grounds below diversion.
	Future treaty and non-treaty fisheries	Fish ticket database/CRC and CWTs
Hatchery production of spring Chinook supplementation program meets release goal.	A minimum of 950 HOR and 50 NOR adults collected annually at White River Hatchery and Buckley Trap for broodstock	Hatchery records
	Minimum egg take of 1.4 M achieved.	
	Fertilization rate and survival from egg to smolt meets production goal of 55,000 yearling smolts and 340,000 fingerlings for on-station release plus additional fingerlings surplus to the core program for off-station release.	
Maintain genetic diversity of hatchery stock.	Only White River spring Chinook are used in the broodstock and NORs are incorporated into broodstock.	All releases are CWT with adipose fin retained. CWTs are read before fertilization. Verify NOR stock identification by DNA testing before use in broodstock to prevent introgression of genes from the fall Chinook population.
	Broodstock are collected throughout migration timing at White River Hatchery and Buckley Traps.	Hatchery and Buckley Trap records
	Develop genotype database.	Genetic material is archived for future DNA analysis.
Maintain life history traits within range of natural origin spring Chinook	Age composition, length frequency, run timing, and distribution are within range of natural origin White River spring Chinook.	Collect scales, lengths, and record run timing at White River Hatchery and Buckley trap for HOR and NOR adult returns throughout migration timing.
		Record spring Chinook smolt age, length, and outmigration timing at proposed future White River smolt trap.

Table 1.10.2. Performance Standards, Indicators, and Monitoring addressing risks.

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Maximize survival at all life stages using biosecurity protocols.	Necropsies of fish to assess health, nutritional status and culture conditions.	NWIFC Fish Health Division inspects broodstock yearly for pathogens and monitors juvenile fish monthly to assess health and detect potential disease problems. As necessary, the staff recommends measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments.
Prevent introduction, spread or amplification of fish pathogens.	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.
Follow current Co-Managers Fish Health Policy.	Inspection of broodstock for pathogens and parasites.	At spawning, a representative sample of broodstock is examined for pathogens.
Ensure hatchery operations comply with state and federal water quality and quantity standards	NPDES permit compliance State water right permit compliance	Flow and discharge data collection and reporting.
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 assessed to maintain compliance with applicable standards and guidelines.
Any distribution of broodstock carcasses for nutrient enhancement occurs in compliance with appropriate disease control regulations and guidelines, including state, tribal, and federal carcass distribution guidelines.	Record of broodstock disease monitoring.	Record carcass distribution locations and ecological benefit parameters.
Minimize impacts and/or interactions to other ESA listed fish.	Hatchery smolts are released at a size and time to maximize probability of rapid outmigration (yearlings) and mimic natural size and timing (subyearlings).	Monitor hatchery release outmigration at proposed White River smolt trap.

1.11) Expected size of program.

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

The maximum broodstock collection level is not anticipated to exceed a total of 1,250 spring Chinook under current hatchery facility capacity. While the broodstock goal is 1,000, additional Chinook must be collected and held in order to meet the target sex ratio; to allow for prespawning mortalities during the extended holding period; and to allow for fish rejected from broodstock upon genetic identification. The Muckleshoot Indian Tribe reserves the right to discontinue current production; modify the current production level; or change species and/or production level reared to meet the needs and policy direction of the Tribe, in consultation with their co-manager, and with the appropriate federal agencies to ensure ESA compliance.

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

Table 1.11.2.1 Annual releases by life stage and location

Life Stage	Release Location	Annual Release Level
Fingerling	Acclimation ponds	Surplus up to 1,300,000
Fingerling	White River Hatchery	340,000
Yearling	White River Hatchery	55,000

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

Table 1.12.1 Performance of acclimation pond releases in terms of percent survival returning to the Buckley Trap. *Source: Puyallup Tribe sampling data from the Buckley Trap.*

Brood Year	Total														Returned to Buckley Trap			Percent Survival
	Released	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	Total	
1992	142,005																	
1993	307,377															3	3	0.0010%
1994	404,426														25	10	35	0.0087%
1995	573,113																0	0.0000%
1996	466,634																0	0.0000%
1997	506,910																0	0.0000%
1998	32,300																0	0.0000%
1999	381,698								1	46	228	97	24				396	0.1037%
2000	135,909							0	29	53	30	24					136	0.1001%
2001	870,590						0	25	189	133	41						388	0.0446%
2002	497,750					2	58	262	277	414							1,013	0.2035%
2003	826,650				1	5	432	368	260								1,066	0.1290%
2004	928,426				7	437	1,212	2,006									3,662	0.3944%
2005	600,400			7	93	37	60										197	0.0328%
2006	829,919		2	127	112	41											282	0.0340%
2007	1,281,000	14	245	227	49												535	0.0418%
2008	1,328,600	249	204	111													564	0.0425%
2009	894,000	769	594														1363	0.1525%
2010	901,800	182															182	0.0202%
2011	517,000																	
2012	560,975																	
	3,641,023	**1,214**	**1,045**	**472**	**262**	**522**	**1,762**	**2,661**	**756**	**646**	**299**	**121**	**24**		**25**	**13**	**9,822**	

Table 1.12.2 White River spring Chinook minimum program performance for on-station releases based on coded wire tag recoveries.

Brood Year/ Group	Smolt to Adult Survival Rate*	Adult Fishery Contribution Rate	Adult Hatchery Escapement Rate
2000 Fingerlings	0.00322	0.00062	0.00260
2000 Yearlings	0.00515	0.00127	0.00389
2001 Fingerlings	0.00189	0.00026	0.00162
2001 Yearlings	0.00478	0.00118	0.00360
2002 Fingerlings	0.00454	0.00036	0.00418
2002 Yearlings	0.02127	0.00276	0.01851
2003 Fingerlings	0.00222	0.00035	0.00187
2003 Yearlings	0.00292	0.00046	0.00246
2004 Fingerlings	0.00514	0.00051	0.00464
2004 Yearlings	0.00978	0.00191	0.00787
2005 Fingerlings	0.00291	0.00029	0.00263
2005 Yearlings	0.00195	0.00007	0.00188
2006 Fingerlings	0.00280	0.00038	0.00242
2006 Yearlings	0.00503	0.00086	0.00416
2007 Fingerlings	0.00312	0.00047	0.00265
2007 Yearling	0.00147	0.00015	0.00132
2008 Fingerlings	0.00112	0.00005	0.00106
2008 Yearlings	0.00290	0.00007	0.00283
2009 Fingerlings	0.00115	0.00001	0.00114
2009 Yearlings	0.00012	0.00000	0.00012

*Based on hatchery rack returns only, does not include spawning ground returns.

Data Source: Pacific States Marine Fisheries Commission's (PSMFC) Regional Mark Information System (RMIS) web site: (http://www.rmpc.org). Information current as of January 30, 2013.

Program performance levels for White River Spring Chinook are measured differently depending on production strategy (on-station releases or acclimation pond fish). On-station releases are coded-wire-tagged and can be tracked through traditional sampling methods in fisheries and at the hatchery rack. Acclimation pond fish are identifiable solely by ventral fin clips. These fish are sampled only at the Buckley Trap.

Performance estimates are minimums. Sampling is at the Buckley Trap is not always possible throughout the full return period due to trap overcrowding and facility limitations. An unknown number of both acclimation pond and coded wire tagged Chinook are passed upstream during the period when the trap is not sampled. Glacial turbidity in the White River also precludes effective sampling of Chinook spawning downstream of the trap and hatchery.

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

The White River Hatchery's first year of operation was 1989. The first acclimation pond used was Huckleberry Creek Army Pond in 1992.

1.14) Expected duration of program.

Indefinite

Currently, the comanagers' short-term goal is a minimum of 1,000 adult natural origin spawners returning to the Buckley Dam for the most recent three out of four years. The long term goal stated in the White River Recovery Plan (1996) is to restore the native population of White River spring Chinook stock in the White River watershed to a healthy, productive condition with an escapement goal that reflects the watershed carrying capacity and is achieved with a full complement of directed and incidental harvest in treaty and non-treaty fisheries.

1.15) Watersheds targeted by program.

White River, Puyallup Basin WRIA 10

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

Assuming availability of eggs, an alternative would be to develop other facilities to hold adults, incubate eggs, and rear juveniles within the basin. This alternative was rejected because alternative facilities with sufficient adult holding, incubation, and rearing capacity are not available, except for a potential future satellite rearing facility at Coal Creek Springs (tributary to the White River at River Mile 10). A second alternative would be to reduce or eliminate hatchery supplementation and rely on natural production. This alternative is not being proposed due to ongoing limiting factors related to fish passage, and freshwater and estuarine habitat conditions.

Finally, dam removal, combined with the restoration of near-pristine properly functioning floodplain, stream channel, water quality, and forest landscape and estuary processes and conditions and sole reliance on natural production were considered but rejected as infeasible.

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

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

This HGMP is being submitted to NMFS for ESA consultation and take prohibition exemption under ESA section 4(d).

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 NMFS ESA-listed salmonid population(s) affected by the program.

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

Puyallup River Fall Chinook and White River Spring Chinook *(Oncorhynchus tshawytscha)*. The White River spring Chinook is the population targeted for integration by the hatchery program. 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 Puyallup River fall Chinook exists primarily within South Prairie Creek, however, the extent of genetic similarity between Puyallup River fall Chinook hatchery stock and South Prairie Creek natural spawners needs further examination. GSI samples have been collected within the two groups but analysis is pending funding availability. "In general Puyallup River fall Chinook enter the river from early June through October, with the peak migration in 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 sub-yearlings. The majority of returning adults spawn as 3 and 4 year-olds. There are returns of 5 year-old spawners, but they form a very small portion of the spawning population." (WDFW et al. 2000, DRAFT).

White River spring Chinook begin entering the river from May through mid-September, and historically spawned in tributaries of the upper White River: West Fork White River, lower Clearwater and Greenwater rivers, and lower Huckleberry Creek (Salo and Jagielo, 1983). The USACE Buckley trap (RM 24.3) adjacent to the Mud Mountain fish passage barrier and Lake Tapps diversion dam intercepts adult returns. The trap is used to collect

broodstock and to transfer adults to historic spawning areas above Mud Mountain Dam. Fry emergence occurs 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 spring Chinook releases coincide with the outmigration of natural-origin spring Chinook as evidenced by simultaneous collections of both hatchery and natural smolts in the White River juvenile trap operated in 2000 and 2001 by WDFW. Spring Chinook typically have stream type life histories; that is extended (a year or more) fresh water rearing.

Scale sample collections at the USACE Buckley fish trap between RY 2000 and RY 2010 indicate that the proportion of the returning adult NORs that out-migrated 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 DNA testing by the Northwest Indian Fisheries Commission of natural origin adult Chinook returning to the USACE fish trap in 1998 and 2004-2007 indicated 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 excluded from the upper White River to the extent possible. Large numbers of pink and coho salmon and trap limitations prohibit culling of ad-clipped fall Chinook at the Buckley Trap.

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

Puyallup River System Steelhead *(Oncorhynchus mykiss):* The native winter steelhead population in the White River is part of the 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 steelhead 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 Trap), the Greenwater River, the Clearwater

River, and the mainstem below the Buckley Trap (Marks, et al., 2011). Scale data indicates that most adults return as 4 year olds. However, age 5 adults may be dominant in 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. A proportion of steelhead return to the ocean after spawning and return to freshwater in subsequent years as repeat spawners.

2.2.2) Status of NMFS 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 Fall Chinook (*O. tshawytscha)* The Puget Sound Chinook Harvest Plan (PSIT and WDFW 2010a) set a natural spawning 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). 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.

White River Spring Chinook (*O. tshawytscha):*White River spring Chinook have low abundance threshold and upper management threshold values of 200 and 1,000, respectively with the upper management threshold based on the number of natural origin spring Chinook recruits passed upstream of Mud Mountain Dam. NMFS has determined a 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 there is an increased risk of further population decline. The viable threshold is a level of escapement associated with rebuilding to recovery under current conditions. The spring Chinook population has maintained total escapement levels above the viable threshold, although the NOR component has dropped below 500 since 2009. Combined Chinook counts at the USACE Buckley trap on the White River have remained above the critical threshold over the last twelve years and above the viable threshold three of those years, but the natural origin component is less than half of the total run. Quantification and stock identification (i.e., spring and fall run, hatchery and NOR) is severely compromised by the inadequacies of the 1940s-era USACE fish trap, which lacks fish sorting and

sampling facilities.

Puyallup River System Steelhead (*O. mykiss):* 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 co-managers 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. The co-managers 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 1,000, respectively (PSIT and WDFW 2010b). The PSSTRT may develop thresholds for each DIP in the future.

- **Provide the most recent 12 year (e.g. 2000-2011) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.**

Puyallup River System Steelhead: 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).

White River spring Chinook and Puyallup River fall Chinook: Data are not currently available.

-Provide the most recent 12 year (e.g. 2000-2011) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

Since 1997, WDFW has conducted redd counts on the Greenwater River (White River tributary), however, these surveys are conducted to document Chinook distribution and origin (NOR/HOR) only, while escapement estimates are obtained from the absolute USACE Buckley trap counts (Larry Philips, WDFW, *pers. comm*). As indicated earlier, reliable quantification and stock identification (i.e., spring and fall run, HOR and NOR) is currently compromised by incomplete sampling and facility limitations of the 1940s-era USACE fish trap. The Puyallup Tribe has conducted redd counts on the Clearwater

River and Boise Creek, and the Muckleshoot Tribe and the Puyallup Tribe have conducted redd counts on Huckleberry Creek.

Table 2.2.2.1. Upper White River Chinook redd counts*

Return Year	Greenwater R. (RM 0.0-7.9)	Huckleberry Cr. (RM 0.0-1.5)	Clearwater R. (RM 0.0-3.8)
1999	81	30	17
2000	76	58	80
2001	244	85	99
2002	59	35	29
2003	108	14	33
2004	101	37	125
2005	29	29	47
2006	116	48	121
2007	25	5	19
2008	191	65	139
2009	n/a	2	14
2010	110	8	43
2011	6	6	8
2012	102	40	19

*Table does not specify race or origin. Note: these counts are only for non-glacially fed tributaries where visual surveys are possible. Source: Puyallup Tribal Fisheries Department and WDFW.

- **Provide the most recent 12 year (e.g. 2000-2011) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.**

Table 2.2.2.2 White River Spring Chinook escapement estimates based on fish trapped at Buckley and transported above Mud Mountain Dam. An unknown proportion of NORs and unsampled fish includes fall Chinook. Counts of out-of-basin hatchery stray Chinook that were sampled and released to the river below the dam are not available.

Return Year	NORs (untagged/ unmarked)	Vent Clipped (Acclimation Ponds)	Hatchery CWT	Not Sampled	Total Hauled to Upper Watershed
1998	241	13		1	255
1999	450	25		3	478
2000	1,435	0		35	1,470
2001	1,905	0		117	2,022
2002	595	97		4	696
2003	1,066	258		101	1,425
2004	1,166	232		81	1,479
2005	942	485		332	1,759
2006	983	655	85	410	2,133
2007	673	1,702	426	2,118	4,919
2008	769	482	377	600	2,228
2009	241	215	104	352	912
2010	305	361	125	112	1,032
2011	249	451	0	2,223	2,923

Note: The accuracy of the above estimates may have been affected by high pink salmon returns

and to a lesser degree, high coho returns, and overcrowding at the USACE trap in recent years leading to increasing numbers of unsampled fish.

Table 2.2.2.3: WDFW Estimates of Puyallup River fall Chinook spawning naturally in the South Prairie Creek sub-basin, plus expanded escapement for fall Chinook in Puyallup basin. *Data source: WDFW SASI 2012.*

Year	South Prairie Creek Spawners	Puyallup Basin Escapement
2000	695	1,193
2001	1,154	1,915
2002	840	1,807
2003	740	1,547
2004	573	1,843
2005	389	1,064
2006	978	2,232
2007	1,194	2,932
2008	925	2,725
2009	710	1,526
2010	382	1,564
2011	439	1,486
Average	**751**	**1,820**

Note: The historic Puyallup R. fall Chinook escapement estimates listed in Run Reconstruction are not considered accurate by the co-managers and do not relate to estimates made by a new method, beginning in 1999. The South Prairie Creek sub-basin has been chosen as an indicator of Puyallup River escapement, with a local spawning objective of 500 adults.

Table 2.2.2.4. Puyallup River system wild winter steelhead index of escapement since 2001. *Source: WDFW (PSIT and WDFW 2010b) and PTI Fisheries reports*. 'Fish Hauled' refers to fish collected at the USACE Buckley Fish Trap and transported upstream of Mud Mountain Dam.

		White River				
Year	Puyallup/Carbon Total	Brood Stock[1]	Program Fish Hauled[2]	Wild Fish Hauled	Boise Creek[3]	White River Total
2001	477	NA	NA	420	43	**570**
2002	326	NA	NA	519	26	**614**
2003	287	NA	NA	162	48	**309**
2004	501	NA	NA	184	101	**338**
2005	162	NA	NA	153	70	**238**
2006	462	26	NA	137	141	**325**
2007	509	27	NA	276	24	**327**
2008	401	24	6	177	46	**254**
2009	241	19	30	116	40	**205**
2010	472	20	298	204	83	**629**
*2011	329	22	359	185	69	**642**
*2012	233	24	210	345	38	**618**

**2011 and 2012 data are preliminary and subject to verification*

[1]*All brood stock are non-program fish, no Blank Wire Tag (BWT) present.*

[2] *Program fish identified by BWT*

[3] *Boise Creek escapement are redd-based counts*

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**.

2.2.3.1 Actions potentially causing direct take of listed fish:

Broodstock Collection, Handling, and Holding: Broodstock is collected at the White River Hatchery trap (right bank) and at the USACE Buckley Trap (left bank) adjacent to the Lake Tapps diversion and fish passage barrier dam. Fish are collected from both traps between mid-May and early October. There is an overlap of spring and fall Chinook arrival timing at the traps. Consequently, to ensure that original White River spring stock is used in spawning, coded-wire-tags are read prior to fertilization. In recent years, natural-origin-recruits (NOR) have been integrated into the broodstock after genetic

verification of stock assignment.

Broodstock Spawning/Pathology Sampling: In the process of broodstock collection and holding, minor losses of White River spring Chinook are expected to occur. Consistent with the Co-Managers Fish Health Policy, ovarian fluid from up to 60 Chinook salmon females and kidney/spleen samples from all Chinook salmon females will be evaluated each year for fish pathogen and disease incidence. Fish disease control measures consistent with the policy will be applied to reduce the risk of adverse effects on listed fish populations in the White River.

Rearing Program: During rearing, minor losses of White River spring Chinook are expected to occur. NWIFC pathologists monitor fish health on a monthly basis. Releases of spring Chinook fingerlings into the White River are consistent with Co-Managers Washington Fish Health Policy (NWIFC and WDFW 2006) protocols and standards to minimize the risks of fish disease pathogen transfer and amplification risk for listed fish populations in the watershed.

Operation of Hatchery Facilities: Operation of the hatchery physical plant will have very minor effects on listed fish in the White River and Puyallup River watersheds. 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 in compliance with discharge guidelines 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.

Monitoring Activities: Adult sampling at the USACE fish trap has a potential to take listed Chinook salmon, bull trout, and steelhead. Sampling procedures which may include taking fin tissue for DNA analysis, scales for age composition, and length measurements may lead to delayed mortality due to handling stress. The annual levels of take are unknown but thought to be very low based on past radio-tracking information from Chinook sampled at the trap and then followed upstream.

The White River Hatchery clips a ventral fin of up to 400,000 juveniles annually before rearing and release at acclimation ponds operated by the Puyallup Tribe of Indians in the upper White River watershed. All acclimation pond fish will continue to be ventral fin clipped annually to evaluate downstream survival of fish released from the ponds and assess their contribution to the total smolt and returning adult populations.

Mortality attributable to the ventral fin clip is highly variable and occasionally substantial (Pacific Salmon Commission 1997). For the purpose of marking the acclimation pond releases to monitor adult returns, the ventral clip was found to be the only feasible alternative to the adipose fin clip or other types of body marks. Excessive mortality has not been observed to date in ventral fin clipped fish during the acclimation pond holding period. Checking all Chinook for a ventral fin clip may also prolong adult sampling

procedures at the USACE and White River hatchery traps. However, this can be done very quickly while other sampling is being conducted and should not cause additional migration delay, descaling, or other injury which would result in mortality.

Sections 11 and 12 near the end of this document describe the specific monitoring, evaluation and research programs proposed for White River spring Chinook 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:

Predation: A limited number of Chinook fry may be vulnerable to predation by hatchery yearling spring Chinook releases made in this program. Their vulnerability is likely greatest as the fry emerge, decreasing to some extent as they move into shallow margin or shoreline areas (U.S. Fish and Wildlife Service 1994). The foraging inefficiency of newly released hatchery smolts may minimize the degree of predation on Chinook salmon fry (FWS 1994). Chinook yearling smolts released from hatcheries may also interact with unsmolted wild steelhead rearing in the tributary and mainstem migration corridors. The Species Interaction Work Group (1984) reported that there is an unknown risk of predation by hatchery Chinook salmon on wild steelhead juveniles where they interact in freshwater migration areas. The Species Interaction Work Group noted that predation may be greatest when large numbers of hatchery smolts encounter newly emerged fry or fingerlings, or when hatchery fish are large relative to natural fish. There is a potential for predation of natural steelhead by hatchery Chinook if the steelhead are small enough. Predators tend to prey on food items less than or equal to one-third of their length (Witty et al. 1995). Non-smolted age two and three steelhead are relatively large in the Walla Walla River (150-175 mm), making predation by hatchery Chinook smolts unlikely (Contor and Sexton 2003). Muir and Emmett (1988) found Chinook smolts actively feeding on invertebrate species such as clodocerans, chironomids, and amphipods during their downstream migration. Larger smolts may eat smaller fish, but recent information indicates that fish are an insignificant fraction of the food consumed by migrating Chinook salmon in the Snake and Columbia rivers (Muir and Coley 1995). Research by Everest and Chapman (1972), and more recent work by Hillman et al. (1987), and McMichael and Pearsons (1999) suggest that, through niche partitioning, spring Chinook juveniles do not significantly affect the natural production of juvenile steelhead

The White River Hatchery yearling releases occur in April at a stage that promotes rapid migration out of the system, minimizing the duration of potential predation on listed species. The size and timing of the program's subyearling releases relative to that of co-occurring listed juveniles also minimizes the potential for predation impacts. Subyearling Chinook are released from the White River Hatchery in mid-May at an average size of 75 mm to 80 mm fork length, when the length of unmarked Chinook captured at the Puyallup River smolt trap (RM 10.6) ranged from 60 mm to 80 mm (Berger et al. 2009). Subyearling releases from the upper watershed acclimation ponds occur at the end of May at a similar size. Spring Chinook begin making a transition from an invertebrate diet to a fish diet

when they reach 120 mm or larger and begin their seaward migration as yearling smolts. In early June 2009, the length of Chinook juveniles captured at the smolt trap operated at river mile 10.6 in the lower Puyallup River ranged from 67 mm to 118 mm (Berger et al. 2009). 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 releases are well below the 201 mm minimum predator length considered to promote predation on natural origin Chinook in the river at the time.

Competition / Niche Displacement: White River spring Chinook released from hatcheries may compete with other listed but naturally produced spring and fall Chinook for food and space in the freshwater, estuarine, and marine environment. The risk of competition in freshwater from hatchery yearling releases has been minimized by release strategies that promote rapid seaward migration. However, there is overlap in time and space between the hatchery subyearling releases and natural origin Chinook. By June 6, approximately 25% of the unmarked age 0 chinook migrants had passed the smot trap and 50% of the unmarked age 0 Chinook outmigration had passed the smolt trap by June 16. Early marine life competition between the hatchery and wild juveniles is unknown.

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**.

Spring Chinook adults are held for up to 4 months for ripening. The annual adult pre-spawn mortality has averaged approximately 22% since 2005. Elevated prespawning mortality of spring chinook in the White River has occurred in the river and in the hatchery holding ponds, and is likely associated with a high incidence of head lesions, other injury, and elevated stress resulting from extremely poor fish passage conditions at the USACE Buckley fish trap and barrier dam, and has been exacerbated by overcrowding due to large pink salmon returns in recent years. Green-to-eyed egg mortality averages 7%. Eyed egg to swim-up fry mortality averages 3%. Swim up fry to subyearling release mortality averages 3% (includes clipping/tagging mortality). Typical rearing mortality of yearlings to release as smolts is 3%. On September 25, 2014, an interrupted water supply led to the mortality of 24,154 yearling fish in rearing ponds at the hatchery. Improved protocols have been put in place to prevent the re-occurrence of this type of failure. In addition, upgrades to the existing water supply alarm system will be installed as soon as possible.

- 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 Table 14.1

- 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.

Take levels will not exceed the maxima provided in Table 14.1

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan. Explain any proposed deviations from the plan or policies.
Not applicable

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 Puget Sound Salmon Management Plan (PSSMP 1985) sets out the legal framework under which comanagement of hatchery programs occurs. The Future Brood Documents are a detailed listing of annual production goals. These are reviewed and updated each spring and finalized in July. This program is consistent with the draft hatchery 4(d) plan for Puget Sound Chinook Salmon Hatcheries developed by Washington Department of Fish and Wildlife & Puget Sound Treaty Tribes -a component of the Comprehensive Chinook Salmon Management Plan Resource Management Plan (2002).

The program reflects the comanager policies and measures stated in the December 10, 1987 agreement entitled "Production Recommendations White River Spring Chinook" (1987) signed by 5 south sound tribes and WDFW.

The program currently follows guidance from the White River Spring Chinook Recovery Plan (WDFW et al., 1996). The plan is implemented by members of the South Sound Spring Chinook Technical Committee comprised of tribal, state, and federal agency representatives.

3.3) Relationship to harvest objectives.

A goal of the hatchery program is to help provide the opportunity for a viable and sustainable fishery on the White River sufficient to satisfy treaty obligations. Program releases have their adipose fins retained to reduce interceptions. The White River Hatchery spring Chinook sub-yearling and yearling programs are managed for harvest in fisheries in accordance with the most current co-managers' "Puget Sound Comprehensive Chinook Management Plans: Harvest Management Component" (PSIT and WDFW 2010a) submitted for ESA review and authorization by NOAA Fisheries.

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

In the short term, harvest of White River spring Chinook will continue to occur in Canadian sport and commercial fisheries, Puget Sound sport and commercial fisheries, and in marine tribal net fisheries. In addition, harvest will occur incidental to sport and tribal net fisheries directed at fall Chinook and coho in the Puyallup River. Harvest will also occur in ceremonial and subsistence (C&S) fisheries that occur both in the Puyallup and White rivers. Incidental catch will increase as production increases. In the long term, the tribes want to harvest White River spring Chinook commercially in traditional net fisheries. Any directed harvest will begin at low levels and increase as the resource allows. In 2010, the co-managers prepared an updated Harvest Management Plan for Puget Sound Chinook salmon. The Plan states specific objectives for harvest of the 15 Puget Sound management units, the technical bases for the objectives, and procedures for their implementation. The Plan assures that the survival and recovery of the Puget Sound ESU for Chinook will not be impeded by fisheries-related mortality. The Plan was submitted and NMFS (NOAA Fisheries) reached a finding, based on the conditions stated in the 4(d) rule, that fisheries-related take in Washington waters is exempt from prohibition under Section 9 of the ESA.

Table 3.3.1.1. Recent average distribution of annual harvest mortality.

Years	Alaska	Canada	WA ocean	Pre-terminal net & troll	PS sport	Terminal net	Escapement
2005-2011	0.000	0.017	0.002	0.015	0.049	0.040	0.877

Source: Pacific States Marine Fisheries Commission's (PSMFC) Regional Mark Information System (RMIS) web site: (http://www.rmpc.org). Information current as of January 30, 2013.

3.4) Relationship to habitat protection and recovery strategies.

The White River Hatchery provides juvenile spring Chinook that contribute to the rebuilding of natural-origin spawners, and ultimately is intended to provide opportunity for a sustainable fishery on the White River. Both the naturally-spawning and the hatchery spring Chinook are included in the listing of the White River spring Chinook stock as a threatened species in the Puget Sound Chinook listing (64 FR 14308, March 24, 1999). The hatchery program helps maintain the abundance, distribution, and life

history diversity of the Chinook population while efforts continue to restore safe fish passage, habitat quantity and quality, and natural ecosystem processes to a level capable of supporting a self-sustaining and harvestable population sufficient to satisfy treaty obligations and non-treaty fisheries. In addition to on-station releases, the hatchery program supports fry releases from acclimation ponds in the upper watershed to restore the historic spawning distribution, life history diversity, and abundance above the impassible Mud Mountain Dam.

The success of the hatchery program in rebuilding the natural White River Spring Chinook population depends on the success of efforts by state, federal, tribal, and local governments to protect and improve riparian, floodplain, forest, estuarine, and nearshore marine areas, as well as water quality in tributaries, mainstems, and Commencement Bay, and to improve fish passage around Mud Mountain Dam.

Full utilization of the spawning and rearing habitat in the upper White River watershed is essential for the sustainability of the White River spring Chinook population. It is critical that the Army Corps of Engineers (USACE) replace the century-old derelict Mud Mountain Fish Passage Barrier Dam at Buckley and the undersized 1930s-era Buckley fish trap and haul with effective fish passage facilities. The existing facilities cause significant stress, delay, injury, and pre-spawning mortality among Chinook and other salmonids. Many fish are unable to find and enter the Corps fish trap, as suggested by the numbers of steelhead and Chinook spawning in Boise Creek, a small tributary 0.9 miles below the Buckley dam. A significant proportion of Chinook hauled upstream above Mud Mountain Dam likely die before spawning. Up to 20% of the spring Chinook sampled in the Corps fish trap during 2013 had head lesions. Typically, about 40% of spring Chinook hauled upstream are unaccounted for in spawning surveys (Blake Smith, PTI, pers. comm). In the 2013 spawning surveys in Huckleberry Creek conducted by PTI, seven of 17 female chinook carcasses sampled on one upper survey section were pre-spawning mortalities. A March 2014 NOAA Biological Opinion issued to the USACE for Mud Mountain Dam operations included a jeopardy determination and requirement to replace and upgrade its fish passage and barrier dam facilities by the year 2020. The new facilities must attract 95% of the fish at the dam and meet a 98% survival rate from the time of fishway entry until fish release upstream. In addition, the USACE is directed to minimize use of the 9 foot tunnel outlet at Mud Mountain Dam until juvenile fish studies can confirm it is a safe outlet for outmigrating fish.

The White River is glacially-influenced stream with a high bedload, an unstable channel, and high turbidity during the glacial melt period. Mud Mountain Dam operations alter natural sediment transport and flow regime. The reservoir inundation zone eliminates 6 miles of mainstem spawning habitat in the White River. Major habitat limiting factors in WRIA 10 include loss of off-channel and floodplain habitat, altered flow regime, fish passage, riparian function, estuarine habitat, water quality, and habitat complexity. The Puyallup estuary was dredged and filled such that only 2% of the historic intertidal saltmarsh remains. Contaminated hotspots occur throughout the estuary despite some remediation work (Kerwin, 1999). Stormwater runoff carries persistent legacy chemicals such as dioxin, lead, arsenic, copper, and flame retardants from a century of development

and industry (Ecology and King County, 2011). While the headwaters are mostly federal lands protected from development, much of the watershed is impacted by a century of poor logging practices, urbanization, transportation and other infrastructure, flood control measures, invasive species, and climate change effects.

High-priority areas for restoration listed in the WRIA 10 Salmon Recovery Plan include the lower and middle Puyallup River, the lower White River, the lower Carbon River, and the Puyallup estuary. Priority actions include floodplain restoration/levee setbacks, estuarine habitat creation, artificial migration barrier removal, and restoration of habitat diversity and riparian conditions (Pierce County, 2008). Priority habitat objectives in the Recovery Plan for White River Spring Chinook (WDFW, PTI and MIT, 1996) consisted of instream flow restoration, elimination of sediment sluicing and downramping in Puget Sound Energy hydropower operations (achieved in 2004 after hydropower decommissioning and the MIT-PTI-Cascade Water Alliance Lake Tapps water rights agreement in 2007); pollution control in streams and in Commencement Bay; floodplain restoration; fish passage improvements, restriction of gravel mining and woody debris removals; and improved riparian and instream diversity.

The South Sound Spring Chinook Technical Committee provides coordination for the White River spring Chinook program. Participating agencies include the Muckleshoot Tribe, WDFW, Puyallup Indian Tribe (PTI), US Forest Service, National Marine Fisheries Service, US Fish and Wildlife Service, and the Northwest Indian Fish Commission. Most of these participating agencies are involved in habitat protection and restoration activities, including forest practices review, water quality monitoring and improvement, water rights and land use proposal reviews, fish passage, Salmon Recovery Funding Board projects, and Commencement Bay toxic remediation.

Recent habitat improvements include a 2007 instream flow agreement between PTI, MIT and Cascade Water Alliance that limits water diversion to Lake Tapps and restores streamflows along a 20-mile reach of the White River. A Tacoma Water pipeline crossing was removed from the White River below Boise Creek, increasing access to that tributary. The creek mouth was restored and the riparian area improved by King County with grant and other funding. Some limited areas of floodplain have been restored in the White and Puyallup rivers. The Forest and Fish rules have led to improved maintenance or decommissioning of unstable roads and barrier culverts on forest lands. Log jams (ELJs) were constructed in a reach of the Greenwater River, the largest spawning tributary of the White River, and a similar project is underway in the Clearwater River. Funding for habitat projects has been provided by the Salmon Recovery Funding Board with matching funds from various sources. However, major limiting factors and constraints on ecosystem restoration remain in the Puyallup/White system.

3.5) Ecological interactions.

(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 Chinook salmon, due to the increased concentration of recently released hatchery outmigrants (Allendorf et al.1997; Wood.1987a,b). Based on research by Hawkins of WDFW, there is a potential impact to both wild 0+ Chinook and out migrating program fingerlings from yearling steelhead, Coho, Chinook and cutthroat smolts, both wild and hatchery (Hawkins, 1998). Predation and competition related effects are generally mitigated by niche separation among species, and the size and abundance of potential predators. 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 to the cutthroat diet though the greatest salmonid biomass was obtained from Chinook prey (Duffy and Beauchamp 2008). Bull trout migrate and forage in the marine nearshore of Puget Sound (Goetz et al. 2003, 2004).

In recent years the mass returns of pink salmon to the vicinity of the hatchery have impacted the program. These impacts include increased stress, spawning ground competition, delays in fish passage and potential competition for food resources in the marine environment. They may also have a benefit in terms of increased food resources or productivity in freshwater for steelhead, bull trout, and coho.

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. 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 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. Chinook 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).

(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).*

As discussed in Section 2.2.3.2 2, the White River Hatchery spring Chinook program should not negatively affect listed salmonids with the present management plan. It is anticipated the program would have a positive impact to avian and mammal species.

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

The White River Hatchery spring Chinook program would benefit from an overall healthy freshwater ecosystem. The input of marine derived nutrients from anadromous salmonid spawned carcasses in the basin will enhance the ecological processes particularly if/when pink salmon returns decline. Juvenile salmonids may serve as prey for hatchery Chinook fingerling releases in the estuary and marine nearshore.

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

The White River Hatchery spring Chinook 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 on the spawning grounds. 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. Increases in populations of other salmon species will increase primary productivity that may benefit both hatchery and natural Chinook fry and outmigrants. In addition, marine derived nutrients are distributed throughout the riparian zone by foraging animals.

The Chinook 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 green herons. Mammals that benefit from migrating fingerlings and adults include river otters, harbor seals, sea lions and orcas.

The Chinook program could contribute adults to serve as prey for southern resident (listed as a threatened species) and transient killer whales that occur in Puget Sound.

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 White River hatchery uses both groundwater and surface water in its operations. Six wells are available for supplying groundwater for fish rearing at the hatchery. Typically, 2 to 3 wells run simultaneously, providing approximately 800-1,100 gpm. Well water is passed through vertical packed columns before reaching the fish rearing areas which adds dissolved oxygen and strips nitrogen. Eggs, fry, and fingerlings receive first pass well water. Yearlings receive a combination of first pass and reuse water. Well water temperatures maintain a moderate range for the fish throughout their rearing in the hatchery. Temperatures do not exceed 52 degrees Fahrenheit in the summer and do not fall below 40 degrees F. in winter. The groundwater used for incubation and rearing at the hatchery is of a more constant temperature compared to the more variable river temperatures at upriver spawning grounds.

Ground water samples from test wells dug before hatchery construction showed relatively high concentrations of iron (0.16 to 0.59 mg/l) and of other heavy metals such as manganese, aluminum, and copper. No recent testing has been done but the aquifer has undergone over 20 years of continuous flushing from the high rate of pumping and subsequent river recharge since the hatchery was built.

May through October, natal surface water collected from the White River is used for adult holding. Due to the high turbidity of surface water there is a sediment removal system, consisting of two centrifugal vortex separators. River water temperatures at the hatchery intake range from the mid to upper 40s Fahrenheit in May to the low to mid 50s in August and back to the mid 40's by late October. Mid-summer turbidities can exceed 600 Nephalometric Turbidity Units (NTU) due to glacial runoff during periods of excessively warm weather. During moderate summer conditions, turbidities are generally less than 200 NTU.

The constructed surface water intake is located ¼ mile upstream of the hatchery building. Two 18" intake pipes are enclosed in a concrete box covered with wedge-wire screen that conforms to NMFS entrainment guidelines. Each of the intake pipes feeds into a concrete vault. One vault contains two 20 hp vertical turbine pumps, the other vault has only one pump with space for another in the future. Delivering approximately 1100 gpm, river pumps are run only during adult collection and the effects on out-migrating juveniles is thought to be minimal as most are believed to be absent in the vicinity of the pump intakes. River water is fed through a 24 inch PVC pipe to the head tank, then distributed to the raceways. The permanent surface water intake system has not been operational for 3 years due to bed-load movement covering the top of the intake screens. Attempts to correct the problem have not been successful. A temporary 30 hp submersible pump has been providing surface water for holding adult Chinook. The pump is placed inside an aluminum screened cage which conforms to NMFS entrainment guidelines. The cage is

put into the river about 75 yards south of the head tank and water is pumped into the head tank through an 8 inch PVC pipe. The pump supplies 1,100 to 1,200 gpm. Centrifugal Vortex Separators are not functional with the temporary river pump system.

Well water and surface water withdrawals for the program are permitted by the Washington State Department of Ecology. The ground water permit was issued March 29, 1988 for 1,950 gpm. An additional 12 cfs surface water right was granted April 3, 1990 to be used in conjunction with ground water for hatchery operation and domestic supply.

A National Pollution Discharge Elimination System (NPDES) permit has not been required for the hatchery since the facility's production does not exceed 20,000 pounds of fish per year or use 5,000 pounds of fish food per month. If criteria change and are otherwise applicable to the Tribal hatchery, then compliance permit requirements is expected.

Water for acclimation sites are all gravity fed with ambient temperature regime.

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.

Both the primary and temporary surface water intake systems conform to NMFS screening guidelines to minimize the risk of impingement of juvenile fish (NMFS 1995, 1996).

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Broodstock are collected at the White River Hatchery and the Army Corps of Engineers' (USACE) trap at Buckley. These two traps are located on the White River at the Cascade Water Alliance's barrier dam at river mile 23.4.

The USACE Buckley fish trap was built in 1941 to provide temporary fish passage during Mud Mountain Dam construction which was completed in 1948. Use of the Buckley trap has continued to date because a fish passage system at Mud Mountain Dam was considered infeasible and was never constructed. The USACE Buckley trap is located on the left bank and consists primarily of a fish ladder, holding pool, and hopper. Approximately half of the annual White River Hatchery broodstock is retrieved from the USACE trap by Muckleshoot and/or Puyallup Tribal staff. In years with high pink salmon returns, the overcrowded USACE trap typically cannot be sampled after mid-August, the mid-point of spring Chinook migration at this river location. Even in non-pink years, sampling is usually not possible after mid-September due to high coho numbers. In these circumstances, all Chinook are passed upstream without sampling or stock designation.

The Hatchery trap is located on the right bank of the river and consists of the fish ladder and holding area. The lower portion of the concrete ladder has 4 steps. The walls are 6 feet apart and 14 feet high at the entrance. The fish enter the upper portion (holding area) of the ladder through an aluminum V-weir. The upper section is approximately 60 feet long by 8 feet wide. Adult fish are removed manually by crowding to the upper end of the holding area and lifting up with a dip net. Tagged (hatchery-origin) fish are transported to concrete raceways for ripening. Unmarked fish (NORs) not used in the broodstock are either taken to the USACE trap in a tote or picked up on site by the USACE tank truck for hauling upriver.

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

Hatchery origin fish (adults) are transported to the raceways via a large tote supplied with supplemental oxygen. Untagged adults are transferred via 1,000 gallon tank truck equipped with supplemental oxygen transported approximately 10 miles upriver and released.

5.3) Broodstock holding and spawning facilities.

Broodstock is held in outdoor raceways partitioned by sex.

5.4) Incubation facilities.

The incubation room at White River Hatchery consists of 24 eight tray stacks of Heath shallow trays. Eggs are water hardened in the trays in a 100-PPM iodine solution for an

hour as a general disinfection procedure. The incubation room receives only well water and is equipped with a local telephone dialer for water outages.

5.5) Rearing facilities.

Emergent fry are put into 11 feet long x 3 feet wide deep fiberglass tanks. There are 16 start tanks in the hatchery building, all supplied with pathogen free well water. Normal flow in each tank is 30 to 35 gpm, which provides approximately four turnovers per hour. Lighting is soft white florescent with ultraviolet blocking sleeves indoor lighting is the only illumination for fry rearing except when cleaning tanks. Dark plastic is used to filter the light coming in through the windows on excessively bright days. Juveniles are moved to outdoor concrete runways when they reach about 1.5 grams in weight. Juveniles are reared in four 95 feet by 8 feet outdoor raceways in the late winter through early summer. The 55,000 fish reserved for the yearling program are moved from the raceways to a 94 feet by 52 feet concrete rearing pond in early summer. Both the raceways and rearing pond are covered with 2 inch mesh bird netting.

5.6) Acclimation/release facilities.

Juvenile fish that are surplus to the hatchery 'core program' are moved to upriver acclimation ponds in late March or early April at a size of 2 grams and released in late May or early June. There are six acclimation ponds, five of which are earthen, and one is made of concrete. Due to variable snow levels, road washouts, or flood damages, some of these ponds may not be useable every year. Only the Greenwater River Pond, the Jensen Creek Pond on the Clearwater River and the Huckleberry Creek ("Army") Pond, have been operational in the last several years.

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

No significant mortality occurred since the hatchery operations began in 1989 up until, September 25, 2014 when an interruption in water supply led to the mortality of 24,154 yearling fish at the hatchery. The surface water intake pump vault became clogged following a moderately high river discharge event. A temporary river pump and groundwater wells were turned on to replace the main surface water supply, however, flow to the rearing pond holding the yearlings fell off and went undetected, as the water levels in the pond remained static and did not trigger the water level alarm. Improved protocols have been put in place to prevent the re-occurrence of this type of failure. In addition, upgrades to the existing water supply alarm system will be installed as soon as possible.

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.

The Hatchery Assistant Supervisor and Hatchery Technician live on site and the entire

staff is linked via pager to the hatchery alarm dialer. The fire protection system is monitored around the clock by contract security vendor. The hatchery possesses a 280 kW diesel generator, which is on continuous standby in case of 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.

Natural spawners from the White River (Puyallup Basin) are collected at the USACE trap and haul located at the Mud Mountain Dam fish passage barrier dam at Buckley, left bank at river mile 23.4, and at the hatchery trap located on the right bank.. The broodstock and the hatchery stock are both listed as threatened as part of the Puget Sound Chinook listing (64 FR 14308, March 24, 1999).

6.2) Supporting information.

6.2.1) History.

Efforts to restore native spring Chinook to the White River have occurred in the following stages:

From 1971 to 1972: In 1971, male spring Chinook were captured at Puget Power's diversion dam near Buckley. Male captures were hybridized with females from several other Chinook stocks. This program was discontinued in 1972.

From 1974 to 1976: Adults were collected at the Buckley trap for the 1974, 1975, and 1976 broods. Captured fish were spawned at Garrison Springs Hatchery near Tacoma and Puyallup Hatchery on Voights Creek, a Puyallup River tributary. Progeny of these spawnings were returned to the White River as fingerlings or smolts.

From 1977 to 1998: Habitat and passage concerns spurred interest in developing an off-site eggbank program on Minter Creek, at the Hupp Springs Hatchery and construction was concluded in the late 1970s. Broodstock for the Hupp Springs facility was supplied through adult returns to the Buckley trap and a captive broodstock established at NMFS Manchester net pen complex. Since 1986 broodstock came exclusively through the captive broodstock. The Manchester captive broodstock operations were discontinued after the1986 brood. The program was replaced by a cooperative effort between Washington Department of Fish and Wildlife (WDFW) and Squaxin Island Tribe at the South Sound Net Pen Complex. Progeny from the SSNP and Minter Creek Hatchery were released solely in Minter Creek until 1990.

The program expanded in 1989 with transfer of excess progeny (from Minter Creek Hatchery) to the recently completed White River Hatchery. The addition of this facility doubled the program's size in terms of broodstock and releases.

Until 1998 eggs were supplied from three sources; captive broodstock from South Sound Net Pens and adult returns to Minter Creek and White River Hatcheries. Releases from Minter Creek and White River facilities include fingerling and yearling release groups. Excess progeny for the Minter Creek facility and South Sound Net Pens are transferred to

the White River Hatchery and acclimation ponds above Mud Mt. Dam for direct release. (WDFW et al. 1998)

From 1998 to the present: Adult spring Chinook returning to the White River Hatchery or WDFW Hupp/Minter Creek facilities are used first to satisfy their respective hatchery broodstock needs, with any surplus used to produce juveniles for transfer to acclimation ponds in the upper White River. Self-sustaining adult returns of White River Spring Chinook origin were originally established at the WDFW Minter Creek and Hupp Springs hatchery complex in 1977as an out-of-basin safety net program. Hupp/Minter facilities are located in an independent drainage adjacent to the Puyallup watershed.

6.2.2) Annual size.

An average of about 558 White River Spring Chinook adults and jacks were spawned annually from 2002 through 2012 with a high of 866 in 2006 and a low of 354 in 2011. The current broodstock collection goal is 1,000 but up to 1,250 will be collected in order to allow for prespawning mortality, male to female ratio, and rejection of fish from the broodstock upon genetic testing.

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

A total of 196 Chinook were taken from the USACE fish trap for broodstock from 1977 through 1986 (WDFW Hatchery Division, Forms 152). These fish provided the egg bank for the current phase of artificial production. The annual numbers of each sex of natural and hatchery (coded wire tagged) fish collected for broodstock in recent years are shown in Table 7.4.2 below. Since the 2005 return year, an average of 41 natural origin brood Chinook have been taken into the hatchery annually (range: 25 to 54) for incorporation into the broodstock resulting in an integration rate between 3.1 and 4.5 percent. The proposed NOR broodstock collection target is a maximum of 10% of the total NOR spring Chinook returning to the fish traps at River Mile 23.4. This target will be reevaluated if the NOR run size is predicted to be less than the critical threshold of 200.

6.2.4) Genetic or ecological differences.

Any changes in genetic or ecological attributes of White River spring Chinook have not been documented. Genetic analyses were conducted in 1991-1993. Samples were collected from spawners returning to Hupp Springs Hatchery (natural spawning surrogate) and from spawners available from the South Sound Net Pens captive population. These facilities were broodstock sources prior the construction of the White River Hatchery. G-test comparisons showed no significant ($P>0.05$) allele frequency differences between the two groups. Comparisons between year to year differences were found to be significantly different, however, are likely to be the result of variability in breeding population sizes. Allele frequency comparisons were also conducted against other fall Chinook baselines in Puget Sound, where significant allele frequency differences existed. (WDFW et al. 1996)

In June 1995, 101 subyearling Chinook smolts were collected in the Lake Tapps Flume below Dingle Basin for genetics analysis. All of the typical alleles (based on the earlier Hupp Springs/South Sound Net Pens analyses) were found including a particular allele found only in White River spring Chinook (Ann Marshall, WDFW).

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.

Only indigenous White River spring Chinook salmon have been selected for original broodstock since the inception of the program. DNA from each fish is collected prior to spawning, All fish used in the hatchery broodstock are genetically screened to insure they are White River spring Chinook and hybrids or fall Chinooks are rejected.

Table 6.3.1. Annual assignment and disposition of NOR Chinook for White River Hatchery based on genetic testing.

Brood Year	Total NORs Collected	NORs Spawned	Mortalities[1]	Fall Chinook	Hybrid/ Unknown	HOR[2]
2013	48	22	23	0	3	3
2012	47	31	4	9	3	
2011	40	16	15	6	3	
2010	30	20	4	5	1	
2009	25	18	4	3	0	
2008	40	19	7	14	0	1
2007	54	36	8	10	0	1
2006	50	27	10	8	5	
2005	42	26	8	6	2	

[1] *Elevated prespawning mortality is similar for the HOR broodstock collected. Injury and stress due to poor conditions at the Buckley dam and USACE fish trap facilities are assumed to be contributing factors.*

[2] *not included in total collected*

SECTION 7. BROODSTOCK COLLECTION

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

Adults

7.2) Collection or sampling design.

Broodstock collection occurs at the White River Hatchery and USACE Buckley Fish Trap. The traps are located on the White River at RM 23.4 adjacent to the Mud Mountain Fish Passage Barrier Dam (formerly a Puget Sound Energy hydropower diversion dam). The White River Hatchery trap is located on the right (north) bank of the river, and the USACE trap is located on the left (south) bank.

The dam at Buckley blocks all volitional upstream fish migration. Spring Chinook begin arriving at the traps from mid to late May. Tribal hatchery staff collect fish from both traps three to five days a week, depending on return numbers, between mid May until late September or early October. Fish are dip-netted out of the traps and checked for a coded wire tag with a hand held wand. All Chinook with a tag are taken to the White River Hatchery for holding. There is an overlap of spring and fall Chinook timing of arrival at the traps. Consequently, to assure original White River spring stock is used in spawning, coded-wire-tags are read prior to fertilization. In recent years some natural-origin-recruits (NOR) have been integrated into the broodstock after genetic verification of stock assignment while some surplus hatchery-origin recruits (HOR) have been released into the upper basin above the dam. Starting in 2004, hatchery staff collected between 12 and 55 natural origin (NOR) Chinook from the USACE Trap while removing CWT fish. All NORs receive both a numbered T-bar tag and a PIT Tag for positive identification. A small piece of the anal fin is removed from each NOR for DNA analysis and stock assignment (by the WDFW Genetics Lab).

Trap limitations on the left bank USACE Fish Trap facility make unbiased collection difficult, as broodstock collection from all parts of the run during pink salmon runs is infeasible and can only be remediated when and if a new improved trap, with adequate holding capacity and modern sorting mechanisms is constructed.

7.3) Identity.

Describe method for identifying (a) target population if more than one population may be present; and (b) hatchery origin fish from naturally spawned fish.

Coded wire tags are read to identify White River Hatchery origin fish prior to spawning. Genetic sampling is used to determine the status of unmarked Chinook for NOB incorporation.

7.4) Proposed number to be collected:

7.4.1) Program goal:

The adult collection goal is 1,000 to meet a 1.4 M egg take goal assuming a 40:60 female to male ratio and an average fecundity of 3,500. Note: Up to 1,250 adult Chinook must be collected to provide 1,000 spring Chinook for broodstock to achieve the target sex ratio, to replace pre-spawning mortalities during the holding period; and to allow for fish rejected as broodstock upon genetic identification.

7.4.2) Broodstock collection levels for the last twelve years (e.g. 2000-2011), or for most recent years available:

Return Year	Adult Females		Adult Males		Jacks			
	CWT	NOR	CWT	NOR	CWT	NOR	Eggs	Juveniles
2000	108	0	620	0	79	0	302,000	269,500
2001	444	0	370	0	152	0	760,750	686,100
2002	179	0	492	0	86	0	670,500	627,100
2003	412	0	595	0	54	0	745,400	689,479
2004	383	4	486	8	615	0	692,602	654,947
2005	316	15	1,256	26	97	1	649,000	610,500
2006	612	14	901	35	466	1	757,600	709,000
2007	483	12	1,197	41	286	1	752,734	685,156
2008	525	14	443	24	235	0	877,697	794,392
2009	336	11	630	14	188	0	917,356	825,630
2010	498	15	582	15	95	0	933,097	840,017
2011	399	18	257	21	97	1	680,762	630,378
2012	381	15	563	30	34	2	937,299	862,888

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

Not applicable.

7.6) Fish transportation and holding methods.

Coded wire tagged spring Chinook collected at the USACE trap are transported to White River Hatchery, for holding, in a large fish tote supplied with supplemental oxygen. Transit time is approximately 20 minutes. Prespawn adult holding occurs in 80 foot by 8 foot concrete raceways, where adults are partitioned by sex.

7.7) Describe fish health maintenance and sanitation procedures applied.

All adult fish are injected upon arrival at the hatchery with florfenicol for the control and prevention of furunculosis, which is caused by the bacterium *Aeromonas salmonicida*. Each adult female is also injected with erythromycin to prevent the vertical transmission of *Renibacterium salmoninarum*, causative agent of bacterial kidney disease (BKD). Additional injections of these antimicrobials are administered during the holding period to maintain therapeutic levels of these drugs in the broodstock. Formalin is administered via flow-through treatments to control the development of external fungal infections. All females are tested for BKD using the indirect fluorescent antibody test at the time of spawning. The eggs of any moderate or highly infected fish are culled out. The eggs of a lightly infected female are used only for the zero-age release group to prevent the possibility of horizontal transmission of the disease during extended rearing. These procedures are consistent with NWIFC fish health guidelines.

7.8) Disposition of carcasses.

All spawned carcasses are disposed of at an upland site and composted. The fish have been administered antibiotics and consequently are not fit for instream or streamside carcass distribution.

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.

The risk of fish disease amplification will be minimized by following Co-manager Fish Health Policy sanitation and fish health maintenance and monitoring guidelines (NWIFC and WDFW, 2006). Natural origin and hatchery origin broodstock will be collected from all parts of the run timing. Eggs and fry transferred to the White River from WDFW Hupp/Minter facilities will be produced by parents that are genetically tested to be White River spring Chinook, and all phases of their culture will occur in water temperatures that are as similar as possible to the White River.

SECTION 8. MATING

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

8.1) Selection method.

Ripe females and males are selected at random and paired in the order of selection. A small number of jacks are included in the spawning population to mimic that which would happen in nature.

8.2) Males.

A back-up male is used to guarantee fertilization but no male is used more than once as either primary or back-up male. Milt from the primary male is given 20 to 30 seconds of fertilization time with gentle stirring before the back-up milt is added.

8.3) Fertilization.

The males' and females' vent area is wiped with a clean paper towel prior to gamete collection. The gametes are placed in individually labeled "zipper-lock" baggies and kept cool in an ice chest until fertilization occurs. The eggs from a single female are combined with milt from a single male in a disinfected 2 gallon bucket. After fertilization is complete, the eggs are rinsed thoroughly and placed in a Heath Tray incubator where they will water harden for 1 hour in a 100 ppm iodophor solution.

Pathogen free well water is then supplied to the trays quickly flushing the iodophor.

8.4) Cryopreserved gametes.

Cryopreserved gametes are not utilized in this program.

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.

Currently utilizing a one-to-one mating scheme.

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.

1,400,000 eggs are (or will be) taken with 750,000 transferred to other facilities at either the green or eyed stage. Average survival rate at White River Hatchery from green to the eyed-egg stage is 95%. See table 7.4.2 above.

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

All available eggs are used in the program.

9.1.3) Loading densities applied during incubation.

Eggs are loaded at approximately 3,000 to 6,000 eggs per Heath tray.

9.1.4) Incubation conditions.

When excess capacity exists, the top tray is left open for sediment catchment purposes. Well water is generally very clean. However, small rust particles may enter the top egg tray when an inactive well pump is exercised or brought on line. Well water enters the incubation stacks with temperature ranges of 42-52 degrees Fahrenheit. Dissolved oxygen concentrations range from 10-11 ppm. Flow rates are 3 to 4 gpm per 8 - tray stack of Heath Trays. Surface water is not used for egg incubation because of its occasional high turbidity.

9.1.5) Ponding.

Fry are allowed to button up completely before ponding. They generally have at least 1,600 Cumulative Temperature Units when ponded. They have a mean weight of 1,200 fpp and a mean length of 26 mm. Fry are involuntarily moved to start tanks from early December through late January.

9.1.6) Fish health maintenance and monitoring.

Formalin is used as an anti-fungal agent for eggs. It is injected into the water supply line for each stack at a concentration of 1667 ppm for 15 minutes every other day.

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.

Eggs are incubated in well water only to maximize egg survival and minimize potential loss from disease and catastrophic loss due to siltation. The hatchery incubation room is protected by a separate low water alarm system and back-up well water supply. Water temperatures are monitored daily.

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.

Average survival from eyed-egg to fry stage is 97%. Survival from initial ponding of fry until release as zero-age fingerlings is about 97%.

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

Maximum density thresholds are 0.5 lbs. fish/ft^3 from initial ponding through grow-out. Loading values vary from less than 1 lb. per gal per minute at ponding (1,200 fish/lb) to 5 pounds per gallon per minute at release for the zero-aged fish (85 fish/lb). The juveniles held over for additional rearing (yearlings) will have loadings of 1.5 lb/gal/min. initially (70 fish/lb) to a maximum of 12 lbs./gal/min. (8 fish/lb) at release.

9.2.3) Fish rearing conditions

Dissolved oxygen (DO), flow, and temperature measurements are taken at the distribution tank (headtank). Raceways and effluent are monitored for DO and flow using hand held meters at periodic intervals. Raceways are vacuumed each week. Juvenile rearing well water temperatures range 42-50 degrees Fahrenheit. The yearling program rearing pond temperatures can reach 52 degrees F. in summer months.

Fry are transferred for rearing to upriver acclimation ponds.

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

Fish per pound (fpp) and average length measurements are taken approximately every two weeks. Condition factor is calculated periodically. The yearling program fish are fed for a target growth weight of 8 fpp by mid-April.

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

White River Hatchery spring Chinook increase their body weight by about 25% per week in their first month. Fish ponded in late December at 1,200 fish per pound will reach 600 fish per pound by late January, 400 fish/lb. by late February, 200 fish/lb by the end of March, and 100 fish/lb. by the beginning of May when the fish are coded wire tagged.

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*).

Feed rations are based on fish size and water temperature. Initially, fry are fed once an hour, 8 hours a day, 7 days a week. At fingerling size, the feeding frequency is decreased to 4 to 6 feedings per day. Sub-yearling fish have a 5 day per week feeding schedules with 2 to 3 feedings per day. Different feed formulations have been tried but the dry crumbles and pellets appear to get the best results through all phases of fish development. Acclimation pond fish are fed Bio-supreme which is a transfer diet, starting in 2012.

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. NWIFC pathologists work with hatchery crews to help avoid pre-spawning mortality of brood fish and maximize fertilization and egg survival. Preventative care is promoted through routine juvenile fish health monitoring. Pathologists conduct fish health exams at each of the tribal hatcheries monthly from the time juveniles swim-up until their release as smolts. Monthly health exams include an evaluation of rearing conditions and lethal sampling of small numbers of juveniles to assess population health status and to detect any pathogens of concern. Results are reported to hatchery managers along with recommendations to improve or maintain fish health. Vaccine produced by the TFHP may be used when appropriate to prevent onset of two bacterial diseases (vibriosis or enteric redmouth disease). In the event of disease epizootics or elevated mortality in a stock, pathologists are available to diagnose problems and provide treatment recommendations. NWIFC 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.

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

Data not collected currently.

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

Natural rearing methods are not applied at White River Hatchery. All the upriver acclimation ponds, except for the Huckleberry Creek Army pond, are natural ponds with gravel, large boulders, logs with root wads, and vegetation around 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.

See HGMP, Section 8 (mating protocols) and Section 9 (incubation and rearing). Upriver acclimation pond hatchery releases will be reared for a short period at water temperatures that mimic those experienced by natural origin fish and volitionally released, to insure that outmigration timing and behavior is as similar as possible to naturally produced listed fish. It is intended that most returns from the acclimation pond releases will home to their historic upriver spawning areas and produce offspring as similar as possible to the natural spring Chinook stock.

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
Fingerling	1,300,000	70-85	Early June	Upriver Acclimation Sites
Fingerling	340,000	80-95	Early June	White R. Hatchery
Yearling	55,000	8	Mid-April	White R. Hatchery

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

Stream, river, or watercourse:

On-station releases
White River Hatchery – WRIA 10.0031

Acclimation Sites
The Huckleberry Creek ("Army") Rearing Pond is located at Mile 0.5 on Huckleberry Creek (10.0253), Puyallup/White River basin, Washington State.

The Huckleberry Creek ("Aerial") Rearing Pond is located at Mile 4.8 on Huckleberry Creek (10.0253), Puyallup/White River Basin, Washington State.

The Greenwater Rearing Pond is located at RM 11.2 on the Greenwater River (10.0122), Puyallup/ White River Basin, Washington State.

The Cripple Creek Rearing Pond is located at RM 0.3 on the Cripple Creek (10.0086), Puyallup/White River Basin, Washington State. Note: currently non-operational due to flood damages.

The Jensen Creek Rearing Pond is located at RM 2.3 on the Jensen Creek (10.0082), Puyallup/White River Basin, Washington State.

Twenty-eight Mile Creek Pond (10.0129) on Twenty-eight Mile Creek at River Mile 0.2, tributary to the Greenwater River, Puyallup/ White River Basin, Washington State. Note: Operation pending completionof a land use permit process.

Release point: See above
Major watershed: White River
Basin or Region: Puyallup River Basin WRIA 10

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

See HGMP, Section 10.1.

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

See Section 10.7 for table with release dates. Release protocols are as follows: Yearlings are released volitionally from the rearing pond beginning in early April. After leaving the pond, they descend a distance of about 600 feet to the river. The last few hundred yearlings are forced out of the pond in early May so that annual maintenance can begin. In late May and early June, the fingerlings are transported from the raceways to the adult collection chamber in the lower fish ladder where they are free to out-migrate to the river.

10.5) Fish transportation procedures, if applicable.

Juvenile fish destined for the upriver acclimation ponds are transported by the Puyallup Tribe of Indians Fisheries Department.

10.6) Acclimation procedures

Normally fish are transported to the upriver acclimation ponds in end of March and released at the end of May through early June. Time/access restrictions may exist due to elevation and road access conditions.

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

Table 10.7.1. On-station hatchery releases and coded wire tagged proportions. Note: Fish are not externally marked.

Released	Date	Size (fpp)	BY	CWT	% Tagged	No. tagged
88,517	4/12/2002	7.5	2000	21-02-87	93.60%	82,852
261,385	5/29/2002	90.6	2001	21-04-03	88.80%	232,110
89,906	4/11/2003	6.7	2001	21-04-04	82.80%	74,442
281,546	5/27/2003	76.8	2002	21-05-11	95.43%	268,679
91,734	4/11/2004	8	2002	21-05-12	94.80%	86,964
274,517	6/1/2004	79.3	2003	21-05-55	92.60%	254,203
89,365	4/14/2005	7.5	2003	21-05-56	89.53%	80,005
274,468	5/19/2005	87	2004	21-05-94	99.48%	273,036
91,730	4/14/2006	8	2004	21-05-95	99.09%	90,904
274,001	5/16/2006	73	2005	21-06-90	100.00%	274,001
69,186	5/17/2006	73	2005	21-06-89	100.00%	69,186
57,391	5/15/2007	7.7	2005	21-06-91	100.00%	57,391
344,775	5/22/2007	74.2	2006	21-07-22	99.80%	344,085
56,687	4/17/2008	7.1	2006	21-07-23	100.00%	56,687
333,906	5/28/2008	62.6	2007	21-07-95	99.01%	330,600
54,630	4/28/2009	7.4	2007	21-07-96	99.61%	54,417
350,218	5/28/2009	87.3	2008	21-08-50	99.80%	349,517
58,713	4/15/2010	7.7	2008	21-08-51	99.80%	58,596
350,325	5/17/2010	77.1	2009	21-09-13	99.03%	346,927
57,422	4/11/2011	6.5	2009	21-09-14	98.40%	56,503
356,564	5/20/2011	83.8	2010	21-09-76	99.16%	353,569
57,673	4/20/2012	7.5	2010	21-09-75	99.00%	57,096
338,023	6/4/2012	80.5	2011	21-10-13	99.60%	336,671

NOTE: All fish released at W.R. Hatchery

Beginning in March of 2000, all hatchery juveniles destined for the acclimations ponds have been ventral clipped.

Table 10.7.2. Marking of acclimation pond releases.

Release site	No. Released	Date	Size (fpp)	BY	Clip	Remarks*
Mowich	201,536	6/17/1998	71	1997		Tagged with Blank Wire
Huck	496,700	6/5/2002	92	2001	Left Vent	
Clrwtr	237,900	6/5/2002	93.7	2001	Left Vent	
Cripple	135,990	6/5/2002	125	2001	Left Vent	
W.R.H	26,400	6/24/2002	61	2001	Ad Clip	
Cripple	55,750	4/24/2003	115	2002	Right Vent	
Clrwtr	199,000	5/28/2003	85	2002	Right Vent	
Huck	243,000	5/28/2003	106	2002	Right Vent	
Aerial	118,000	4/20/2004	188	2003	Left Vent	
Cripple	86,950	6/1/2004	114	2003	Left Vent	
Aerial	27,900	6/1/2004	85	2003	Left Vent	
Clrwtr	237,800	6/1/2004	79.7	2003	Left Vent	
Huck	356,000	6/16/2004	88	2003	Left Vent	
CW River	120,393	4/4/2005	147	2004	Right Vent	Released in Clearwater R.
GW River	33,516	4/4/2005	147	2004	Right Vent	Released in Greenwater R.
Aerial	82,450	6/3/2005	100	2004	Right Vent	
Huck	464,980	6/3/2005	90	2004	Right Vent/Anal BT	
Cripple	99,587	6/3/2005	75	2004	Right Vent/Dors BT	
Clrwtr	132,498	6/3/2005	69.8	2004	Right Vent/Caud BT	
Aerial	107,850	6/7/2006	81.1	2005	Left Vent	
Huck	254,550	6/7/2006	86.4	2005	Left Vent	
Cripple	71,450	6/7/2006	65.4	2005	Left Vent	
Clrwtr	166,550	6/7/2006	84.5	2005	Left Vent	
CW River	207,870	4/4/2007	195	2006	Right Vent	Released in Clearwater R.
GW River	223,740	4/12/2007	165	2006	Right Vent	Released in Greenwater R.
Aerial	93,804	5/30/2007	90.6	2006	Right Vent	
Clrwtr	193,375	5/30/2007	67.9	2006	Right Vent	
Huck	99,736	6/5/2007	182	2006	Right Vent	
Grnwtr	550,000	5/14/2008	78.2	2007	Left Vent	
Huck	514,000	5/29/2008	98.1	2007	Left Vent	
Clrwtr	217,000	6/2/2008	70	2007	Left Vent	
Cowskl & Rushingwater	314,872	6/1/2009	79.6	2008	Right Vent	126,534 CWT

Release site	No. Released	Date	Size (fpp)	BY	Clip	Remarks*
Huck	382,300	5/23/2009	103	2008	Right Vent	
Grnwtr	830,996	6/2/2009	94.5	2008	Right Vent	
GW River	115,600	3/26/2009	159	2008	Right Vent	Released in Greenwater R.
Huck	505,000	5/21/2010	99	2009	Left Vent	
Grnwtr	389,000	5/21/2010	92.1	2009	Left Vent	
Huck	525,650	6/6/2011	95.3	2010	Right Vent	
Grnwtr	376,150	6/6/2011	96.4	2010	Right Vent	
Huck	309,500	5/17/2012	81.7	2011	Left Vent	
Grnwtr	207,500	5/17/2012	94.5	2011	Left Vent	
W.R.H	24,550	5/17/2012	160	2011	Left Vent	Extra fish from WRH

***NOTE:** All fished released from acclimation ponds unless otherwise noted.

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.

Monthly fish health monitoring exams, as described in section **9.2.7**, are conducted by a fish pathologist from the Northwest Indian Fisheries Commission up until the time of release. Fish are usually examined within 2 weeks of their scheduled release. The exam includes an assessment of mortality rate, fish behavior, general condition of the fish, and rearing conditions. A necropsy is performed on representative fish from the population, including moribund and dead fish if these are available. An attempt is made to determine factors contributing to mortality. Parasites are routinely screened for by microscopic examination of gills and skin scrapes. Bacterial or viral assays may be conducted at the discretion of the pathologist if there is evidence of an infectious disease problem. Depending upon the findings of the exam, a recommendation will be made to either release the fish as planned, or if necessary, to take appropriate management actions prior to release.

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

In such an event, screens will be removed immediately and fish will be released to the river.

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 extent of the interactions between hatchery releases and naturally reared listed winter steelhead, fall and spring Chinook, and bull trout is unknown. All fingerling and yearling Chinook will be released when actively smolting to promote outmigration as quickly as

possible and minimize potential for interaction with natural Chinook or steelhead.

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.

White River Spring Chinook Recovery Plan Monitoring Tasks have been developed (see sections 1.10.1 and 1.10.2).

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 1.9

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.

See Section 2.2.3 (pertaining to adult sampling).

SECTION 12. RESEARCH

Provide the following information for any research programs conducted in direct association with the hatchery program described in this HGMP. Provide sufficient detail to allow for the independent assessment of the effects of the research program on listed fish

12.1) Objective or purpose.

Unless prevented by exigent circumstances, the Muckleshoot Tribe will tag or mark all spring Chinook salmon juveniles released through the hatchery program each year to allow monitoring and evaluation of juvenile out-migrants and adult returns, and to maintain separation during hatchery spawning between spring Chinook and fall Chinook stocks.

Marks and/or tags applied should also allow for the differentiation of first generation acclimation pond-origin fish from spring Chinook released directly from White River Hatchery. All on-station juvenile spring Chinook releases have been coded wire tagged since 1990. Ventral fin clipping of the acclimation pond juveniles began in 2000.

12.2) Cooperating and funding agencies.

Muckleshoot Indian Tribe, Puyallup Tribe of Indians, and Washington Department of Fish and Wildlife, US Army Corps of Engineers

12.3) Principle investigator or project supervisor and staff.

The agencies identified in 12.2 are cooperating investigators.

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

Both the natural and the hatchery stock are listed as threatened.

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

MS-222 anesthetized and ventral fin clipped, CWT'd in Automatic Trailer (not anesthetized).

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

Fish will receive a ventral clip beginning in late March.

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

Ventral clipping occurs on-station at White River Hatchery. Fish are crowded, and then captured via a dip net. Upon capture fish are transported to the marking trailer holding

tank in a 5 gallon bucket. Fish densities in the holding tank do not exceed .5 lbs/gal. Handling time from when fish are captured to release back into the raceway does not exceed 1.5 hours.

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

Direct mortality from specimen sampling and potential delayed mortality from clipping.

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 2).

Approximately 350K zero age spring Chinook are coded wire tagged (no fin clip) and 250K zero age spring Chinook are ventral fin clipped at White River Hatchery annually. Mortality associated with handling during tagging or clipping is unknown.

12.10) Alternative methods to achieve project objectives.

An alternative coded-wire body tag placed near the dorsal fin was tested on small non-listed hatchery fall Chinook. This method was not successful due to poor retention and Injury to fish.

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

No other salmonid species is affected by this research.

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.

Chinook inspected at adult and smolt traps for ventral fin clip will be handled with care and returned to the river or fish trap as expeditiously as possible for upstream transport by the Corps of Engineers above Mud Mountain Dam.

SECTION 13. ATTACHMENTS AND CITATIONS

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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. By submitting this material, the Muckleshoot Tribe is not conceding the application of the ESA to its hatchery operations. This information is primarily submitted to facilitate the ability of NMFS to carry out its duties under the ESA consistent with the government to government relationship between the Muckleshoot Indian Tribe and the United States."

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

Table 14.1. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: Chinook **ESU/Population:** Puget Sound Chinook/White River Spring Chinook **Activity**: White River Spring Chinook Hatchery Program				
Location of hatchery activity: Enumclaw, WA **Dates of activity:** Year round **Hatchery program operator:** Muckleshoot Indian 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	1000	
Collect for transport b)	0	0	1000	0
Capture, handle, and release c)	0	0	1000	0
Capture, handle, tag/mark/tissue sample, and release d)	0	0	300	0
Removal (e.g. broodstock) e)	N/A	N/A	1000	N/A
Intentional lethal take f)	N/A	N/A	1000	N/A
Unintentional lethal take g)	Up to 695,000	Up to 55,000	Up to 200	0
Other Take (specify) h)	N/A	N/A	N/A	N/A

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.

ADDENDUM A. PROGRAM EFFECTS ON OTHER (AQUATIC OR TERRESTRIAL) ESA-LISTED POPULATIONS. (Anadromous salmonid effects are addressed in Section 2)

15.1) List all ESA permits or authorizations for USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species associated with the hatchery program.

This HGMP is being submitted for ESA consultation and take prohibition exemption under ESA section 4(d).

15.2) Describe USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species and habitat that may be affected by hatchery program.

Puyallup River bull trout (*Salvelinus confluentus)*

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 to spawn in Silver Spring and Camp Creek, both tributaries to the White River (Puyallup River tributary) and other small tributaries in the upper watershed. 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).

Stock status of bull trout in the Puyallup River system is not well known as the only only consecutive annual data is from the USACE adult fish trap at the former Puget Sound Energy diversion dam at Buckley (Table 15.3.1). 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. In addition, redd data has been collected by the Puyallup Tribe of Indians in selected upper White and Puyallup tributaries and is available in annual reports (e.g. Marks, E. L. et al. 2009). Bull trout counts at the USACE trap have an increasing trend, possibly associated with the high odd year pink salmon returns in the White River beginning in 2005, with a total of 264 bull trout (char) counted at the trap in 2013.

Table 15.3.1 Adult Bull Trout Counts at the White River, USACE Buckley Fish Trap, River Mile 24.3.

Return Year	Count at USACE Fish Trap	Hauled above Mud Mountain Dam
1999	24	29
2000	48	40
2001	39	31
2002	41	41
2003	49	49
2004	45	37
2005	34	39
2006	38	36
2007	44	46
2008	14	14
2009	90	90
2010	84	84
2011	73	73
2012	161	161
2013	264	264

(Source: SalmonScape 2012 and USACE)

Listed or candidate species: ***No effect for the following species:***

Marbled murrelet (*Brachyramphus marmoratus*) –Threatened [critical habitat designated]
Canada Lynx (*Lynx canadensis)* –Threatened [critical habitat designated]
Gray Wolf (*Canis lupus)* –Threatened
Grizzly bear (Ursus arctos horribilis) –Threatened
Northern Spotted owl *(Strix occidentalis caurina)* –Threatened [critical habitat designated]

Candidate Species:

Fisher (*Martes pennanti*) – West Coast DPS
North American wolverine *(Gulo gulo luteus*) – contiguous U.S. DPS
Oregon spotted frog (*Rana pretiosa)* [historic]
Yellow-billed cuckoo (*Coccyzus americanus*)
Whitebark pine (*Pinus albicaulis*)

15.3) <u>Analyze effects.</u>

Broodstock collection, water discharges, and hatchery water intake structures may pose a risk to any bull trout that might be in proximity to these facilities, however this risk is low. Only one bull trout has been encountered in the hatchery's broodstock collection trap in the last 7 years (Matt McDaniel, MITFD, pers. comm.) despite the fact that broodstock collection overlaps with the timing of peak bull trout returns (between May and August) at the USACE adult fish trap on the opposite bank. Attraction flow to the hatchery trap entrance is less than 12 c.f.s., in comparison to the much higher attraction flows to the USACE trap entrance and river thalweg location on the opposite bank.

Water discharges from the hatchery may affect water quality in Crisp Creek, however, the risk of water quality degradation affecting the health of bull trout would be low given that given the fish biomass involved and amount of feed applied, water treatment facilities, and best management practices used to minimize any impact from water discharged from the hatchery. Hatchery operations also comply with any NPDES permit and monitoring requirements to avoid or limit adverse effects on water quality.

The White River Hatchery operates on surface water from the river and on groundwater. Water withdrawals are non-consumptive, and do not exceed the rates authorized by existing state water rights certificates. The risk of entrainment to juvenile bull trout at the surface water intake structures is very low given compliance with federal juvenile fish protection/screening criteria.

Hatchery operations may introduce or spread fish pathogens that might pose a risk to the health of any bull trout that may occur in the creek. However, this risk would be low as hatchery facilities and fish culture practices are operated in compliance with all applicable fish health guidelines, facility operation standards, and protocols, including routine monitoring and testing for pathogens.

Hatchery Chinook releases, including those made both on station and from the upriver acclimation ponds, are a potentially significant source of prey for bull trout in the White River.

15.4 Actions taken to minimize potential effects.

The White River Hatchery trap is checked at least daily when in use. Any bull trout found in the trap are immediately returned to the stream. Bull trout may also be encountered in the Buckley Fish Trap during broodstock collection activities. Care is taken to collect broodstock as quickly and gently as possible to minimize stress and avoid injury to bull trout. Annual estimates of bull trout encounters through the hatchery activities are recorded and reported.

Water intake structures are screened in compliance with current NMFS and USFWS fish protection criteria. Water intake screening and structures are inspected several times each week to insure they are operating correctly. Any bull trout encountered at the water intake facilities would be returned immediately to the river.

A clarifier is used to treat effluent and solids cleaned from raceways, and best management practices are used to minimize impacts to water quality from water discharged from the hatchery.

Program facilities are operated in compliance with all applicable fish health guidelines, facility operation standards and protocols including the Co-managers Fish Health Policy (NWIFC and WDFW, 2006) to prevent the introduction or spreading of fish pathogens including routine monitoring and testing for pathogens.

15.5 References

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