HATCHERY AND GENETIC MANAGEMENT PLAN

(HGMP)

Hatchery Program:	White River Winter Steelhead Supplementation Program
Species or Hatchery Stock:	White River Winter Steelhead - *Oncorhynchus mykiss*
Agency/Operators:	Muckleshoot Indian Tribe and Puyallup Tribe of Indians
Watershed and Region:	Puyallup River/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 Winter Steelhead Supplementation Program

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

White River Winter Steelhead (*Oncorhynchus mykiss*), listed as threatened under the Endangered Species Act (ESA) as part of the Puget Sound Distinct Population Segment (DPS), for Puget Sound Steelhead (National Marine Fisheries Service, May 11, 2007).

1.3) Responsible organization and individuals

Lead Contact: White River Hatchery Operations:

Name (and title): Dennis Moore, Fish Enhancement Manager
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Acclimation Pond Facility Operations Contact:

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

The United States Army Corp of Engineers (USACE) operates the Buckley Fish Trap (River Mile 24.3) to transport adult salmonids above Mud Mountain Dam (RM 29.7). This trap is also used to collect broodstock, along with the hatchery fish trap located on the opposite river bank adjacent to the White River Hatchery.

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

Tribal and BIA fund sources. 4-15 staff according to season. Total estimated annual cost for steelhead program activities only is $49,000 (not including overall O&M costs for the White River Hatchery).

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

The White River Hatchery is located on the right bank of the White River (10.0031) at River Mile (RM) 24.3. The White River is a tributary of the Puyallup River (10.0021) with the confluence located at RM 10.0. Broodstock collection will occur at the White River Hatchery Trap (right bank) and at the White River Buckley Trap operated by the USACE at RM 24.3 (left bank) used to collect and transport adult salmonids over Mud Mountain Dam on the at RM 29.7.

Acclimation Pond Sites in the Upper 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 Twenty-eight Mile Creek (10.0129) Rearing Pond is located at River Mile 0.2 on Twenty-eight Mile Creek, tributary to the Greenwater River, Puyallup/ White River Basin, Washington State. (Construction is pending completion of a land use permitting process).

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

1.6) Type of program.

Integrated Recovery

1.7) Purpose (Goal) of program.

Restoration. The goal of this program is the restoration of steelhead in the White River using the indigenous stock.

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 winter steelhead in the White River watershed.

The White River winter steelhead hatchery program has operated under a Memorandum of Understanding by the Co-Managers; the Puyallup Tribe of Indians (PTI), the Muckleshoot Indian Tribe (MIT) and the Washington Department of Fish and Wildlife (June 9, 2006). Until 2013, incubation and initial rearing of White River steelhead has occurred at the Puyallup Tribe's Diru Creek fish hatchery facilities with final rearing and release at the White River Hatchery. In 2014, final rearing and release occurred at an upper watershed acclimation pond in Huckleberry Creek. As provided in the MOU, the program will be transferred to the White River Hatchery and operate under this HGMP beginning in 2015, with acclimation and release at one of several upper watershed acclimation ponds.

The ultimate goal of this program is to help restore indigenous steelhead in the White River to levels providing sufficient harvest opportunity. Salmon and steelhead harvest is essential to the culture and well-being of the Muckleshoot Indian Tribe. 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 steelhead in the White River has been diminished by the extensive loss and degradation of habitat in the watershed. 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 below.

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**
Abundance and Recovery		
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 trending towards a viable self-sustaining population.	Buckley and White River trap counts, escapement surveys, and scale samples for age composition to assess abundance and productivity. NOR and HOR counts at Buckley and White River trap and HOR contribution to spawning grounds. Note: Fully comprehensive monitoring requires planned USACE replacement of existing 1940s- era fish trap with improved sorting and capacity functions.
	Population that supports future treaty/non treaty fisheries.	Fish ticket/CRC database
	Releases above Mud Mountain Dam increasing natural production.	NOR and HOR counts at Buckley trap and HOR contribution to spawning grounds above and below diversion.
Hatchery production of winter steelhead supplementation program meets release goal.	At least 20 wild adults (10 pairs) collected annually at White River Hatchery trap and Buckley Trap for broodstock	Hatchery records
	An egg take goal of 48,000 achieved.	
	The rate of fertilization and survival from egg to smolt provides for a production target of 35,000 yearling smolts.	
Diversity and Life History Traits		
Maintain genetic diversity of hatchery stock	Only wild (unmarked) adults are used for broodstock.	Hatchery records.
	Broodstock collected through-out range of migration timing	Buckley Trap records
	Develop genotype database.	Genetic material is archived for future DNA analysis.
Maintain life history traits within range of natural origin steelhead	Age composition, length frequency, and run timing within range of natural origin steelhead.	Collect scales, lengths, and record run timing at Buckley trap for HOR and NOR adult returns
		Record steelhead smolt age, length, and outmigration timing for marked and unmarked at proposed White River smolt trap.

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

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Artificial Production Facility Operations		
Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring	NPDES permit compliance State water right permit compliance	Flow and discharge 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 compliance assessed and needed fixes are prioritized.
Any distribution of broodstock carcasses or other products for nutrient enhancement is accomplished in compliance with appropriate disease control regulations and guidelines, including state, tribal, and federal carcass distribution guidelines.	Record of broodstock disease monitoring. The fertilization protocol is live gamete extraction and broodstock are released back into the river as kelts. Therefore mortality numbers are low.	Record carcass distribution locations and ecological benefit parameters. Record of kelt releases.
Minimize impacts and/or interactions to ESA listed fish.	Hatchery Steelhead yearling smolts are released at size (~ 200 mm) and time to maximize probability of rapid outmigration. Only unmarked fish are used for broodstock.	Monitor hatchery release outmigration.
Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens. Follow Co-Managers Fish Disease Policy.	Necropsies of fish to assess health, nutritional status and culture conditions.	NWIFC Fish Health Division inspects adult broodstock yearly for pathogens and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, the staff recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as necessary.
	Inspection of adult broodstock for pathogens and parasites.	At spawning, a representative sample of adult broodstock is examined for pathogens.

1.11) Expected size of program.

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

Maximum of 15 females and 20 males

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

Table 1.11.2.1. Proposed annual maximum fish release levels.

Life Stage	Release Location	Annual Release Level
Yearling	White River (from acclimation pond(s) on Clearwater, Greenwater, or Huckleberry Cr tributaries upstream of Mud Mt Dam)	Maximum of 60,000

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. White River wild brood steelhead program survival rates for brood years 2006 to 2012. Survival data are incomplete pending data from adults returning in 2013, 2014, and 2015.

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

Brood Year	# Adults	*Facilities for:*			Release Year	# Released	Return Year	Brood Year Survival Rate
		Spawning	Rearing	Release				
2006	26	Voights	Diru	WR	2007	25,631	2008	0.1510%
2007	27	Voights	Diru	WR	2008	56,378	2009	1.0284%
2008	24	Diru	Diru	WR	2009	31,531	2010	0.1667%
2009	19	Diru	Diru	WR	2010	26,310	2011	1.0667%
2010	20	Diru	Diru	WR	2011	27,876	2012	0.5101%
2011	22	Diru	Diru	WR	2012	31,129	2013	0.0646%
2012	24	Diru	Diru	WR	2013	27,990	2014	
2013	28	Diru	Diru	Huckleberry	2014	47,912	2015	

The White River winter steelhead hatchery program has operated under a Memorandum of Understanding by the Co-Managers; the Puyallup Tribe of Indians (PTI), the Muckleshoot Indian Tribe (MIT) and the Washington Department of Fish and Wildlife (July 5, 2006). Broodstock collection began in late spring of 2006. Through 2013, incubation and initial rearing of White River steelhead occurred at Puyallup system Voights or Diru hatchery facilities with final rearing and release at the White River Hatchery. As provided for in the Memorandum of Understanding, program activities including spawning, incubation, and initial rearing will be transferred the White River

Hatchery as described in this HGMP beginning in 2015, with final rearing and release of juveniles to occur in acclimation ponds in the upper watershed upstream of Mud Mountain Dam.

1.14) Expected duration of program.

The current variability in adult survival indicates the program should be continued unless otherwise agreed by the co-managers.

1.15) Watersheds targeted by program.
White River (10.0031)

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

Alternative 1: No action. Escapements of wild winter steelhead to the White River are considered to be in decline since the mid 50s. The 50-year average return in the White River has been 479 (range of 156 in 1958 to 1,971 in 1988). Since 1990, the average return has been 433 fish and since the mid 90s it has been less than 360 and at times less than 200 (See Table 2 in Section 2.2.2). Without this program the effective population size may have diminished below self-sustaining population size.

Finally, large scale basin wide habitat and natural processes restoration including dam removal; restoration of near-pristine floodplain, stream channel, water quality, and forest landscape and estuary conditions with sole reliance on natural production was 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 ESA-listed salmonid population(s) affected by the program.

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

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

The White River steelhead is the population targeted for integration by the hatchery program. 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 spawn in Boise Creek (right bank tributary of the White River just downstream from the Buckley Fish Trap), the Greenwater River, the Clearwater River. Scale data indicates that most adults return as 4 year olds. However, age 5 adults may be predominant on intermittent return years.

The Puyallup/Carbon DIP enter the river in the fall. Spawn timing extends from March to mid-June. The Carbon River population spawns in Carbon River tributaries including South Prairie, Voights, and Wilkeson creeks with additional spawning in the Puyallup main stem tributaries.

Puget Sound winter steelhead rear in freshwater for the first one to three years before migrating to marine waters. The juveniles migrate rapidly through Puget Sound into the North Pacific Ocean. Adults spend several years in the ocean before returning to

their natal stream to spawn. Steelhead spawn in moderate gradient reaches of streams. Steelhead are iteroparous, with a proportion returning to the ocean after spawning to return in subsequent years to repeat spawn.

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

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

A naturally spawning population of 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 fund availability. "In general Puyallup River fall Chinook enter the river from early June through October, with the peak migration in mid-to late August. Natural spawning begins in early September and is completed by early November, peaking in late September to early October. Typical of most Puget Sound summer/fall Chinook stocks, Puyallup River fall Chinook juveniles out-migrate as sub-yearlings. The majority of returning adults spawn as 4 yr-olds, with a lesser contribution of 3 year-olds. There are returns of 2 to 5 year-old spawners, but they form a very small portion of the spawning population." (WDFW et al. 2000, draft).

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

Scale sample collections at the 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 the 1998 and 2004-2007 DNA sampling of returning natural origin adult

Chinook at the USACE fish trap indicates a broad return timing of spring type Chinook from May through October. Fall-type Chinook overlapped to some degree with spring type with a July peak return for spring Chinook and an August peak return for fall Chinook during the 2004-2007 return years. Ad-clipped fall Chinook are 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.

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 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 (PSSTRT 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. Using abundance data series beginning in 1977, the estimated mean population growth rate is 0.931 for the Puyallup/Carbon DIP indicated a declining trend. Although White River winter-run steelhead escapements clearly declined through the early 1990s, the population showed evidence of nearly neutral growth rate at a 0.997 productivity value (PSSTRT 2012). The 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 than1000, respectively (PSIT and WDFW 2010b). The PSSTRT may develop thresholds for each DIP in the future.

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.

Table 2.2.2.1: 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 River fall Chinook escapement estimates listed in Run Reconstruction are not considered accurate by the co-managers and are not relative 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.)

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. It is important to note that 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.

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

Also refer to subsection above and any associated references.

Puyallup System Steelhead: Using abundance data series beginning in 1977, the estimated mean population growth rate is -0.071 (λ=0.931) for the Puyallup/Carbon DIP indicated a declining trend. This was calculated using a MARSS-based (Holmes and Ward 2011) population viability analysis for Puyallup/Carbon River winter-run steelhead. 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).

Table 2.2.2.2. Measures of productivity for White River winter steelhead. Data source from Blake Smith, Puyallup Tribal Fisheries and Adrian Spidle, NWIFC. Program fish productivity was estimated for only those brood years with at least 4 year-classes of return so far (ages 2-5).

Brood Year	NORs hauled	Broodstock taken[1]	HORs hauled[2]	NORs produced[3]	NORs/ spawner[4]	HORs produced[2, 3]	HORs/ Broodfish[4]	Upper White	Lower White	White River Total
2001	424			147.30	0.35			424	150	574
2002	519			275.10	0.53			519	95	614
2003	161			139.19	0.86			161	147	308
2004	176			214.27	1.22			176	154	330
2005	153			167.42	1.09			153	85	238
2006	163	26		252.23	1.55	38.7	1.49	163	162	325
2007	303	27		259.98	0.86	579.7	21.4	303	24	327
2008	211	24	6	330.62	1.52	52.5	2.19	217	47	264
2009	135	19	30	214.84	1.30	280.6	14.7	165	40	205
2010	224	20	298					522	107	629
2011	207	22	359					566	76	642
2012	370	24	210					580	39	619
2013	363	28	211					574	59	633

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

[2]Program fish are identified by a BWT.

[3]The number of fish of that origin sampled in subsequent years and aged to the brood year expanded by the proportion of the number of fish aged that year. Data from PTI.

[4]Number of fish produced that brood year divided by number hauled or size of broodstock

[5]Counts for the Lower White River are redd based counts

The productivity estimates and relative performance of program fish and NORs shown in Table 2.2.2. suggest that habitat conditions in freshwater are an important influence on this population.

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

Table 2.2.2.3 Puyallup River system wild winter steelhead index of escapement since 2001 from WDFW (PSIT and WDFW 2010b) and PTI Fisheries. 'Fish Hauled' refers to fish collected at the USACE Buckley Fish Trap and transported upstream of Mud Mountain Dam. Due to delayed and pre-spawning mortality effects from poor fish passage conditions at the USACE barrier dam and trap, actual spawning abundance may be less than the number of fish hauled.

Brood Year	White River					White River Total	Puyallup/ Carbon
	NORs hauled	Broodstock taken[1]	HORs hauled[2]	Upper White	Lower White[5]		
2001	424			424	150	574	477
2002	519			519	95	614	326
2003	161			161	147	308	287
2004	176			176	154	330	501
2005	153			153	85	238	162
2006	163	26		163	162	325	462
2007	303	27		303	24	327	509
2008	211	24	6	217	47	264	401
2009	135	19	30	165	40	205	241
2010	224	20	298	522	107	629	472
2011	207	22	359	566	76	642	329
2012	370	24	210	580	39	619	233
2013	363	28	211	574	59	633	447

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

[2]Program fish are identified by a BWT.

[3]The number of fish of that origin sampled in subsequent years and aged to the brood year expanded by the proportion of the number of fish aged that year. Data from PTI.

[4]Number of fish produced that brood year divided by number hauled or size of broodstock

[5]Counts for the Lower White River are redd based counts

- Provide the most recent 12 year (e.g. 2000-present) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known. *(Include estimates of juvenile habitat seeding relative to capacity or natural fish densities, if available).*

Puyallup System Steelhead (*Oncorhynchus mykiss*): Natural escapement is based on redd expansion surveys counted after March of the year (**SaSI** Web Database 2007). There is no breakdown of redds created prior to this time period although some hatchery spawner monitoring has been done in South Prairie Creek (tributary to the Carbon River) indicating a number of hatchery spawners for those reaches only (pers. comm., Sharpf, M. 2008). Additional White River stock may exist below the Buckley Trap and in Boise Creek.

White River Steelhead. Using data in Table 2.2.2.3 the proportion of hatchery–origin (program) steelhead hauled above Mud Mountain Dam averaged 36% of steelhead between 2008 and 2013. The proportions of natural and hatchery origin steelhead in the lower river are unknown.

2.2.3) <u>Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of NMFS listed fish in the target area, and provide estimated annual levels of take</u> *(see "Attachment 1" for definition of "take")***.**

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

Broodstock Collection (Buckley Trap and White River Hatchery trap):

White River winter steelhead are collected at the Buckley Trap and White River Hatchery trap as part of the USACE ongoing trap and haul operation of salmonids taken upstream of Mud Mountain Dam. Steelhead not selected for broodstock are trapped, handled, and passed upstream during trap operations which may lead to injury or mortality although mortalities are rare if ever observed. Fish selected for broodstock will be taken to the White River Hatchery. Other listed fish collected (but not targeted during steelhead collection) at the Buckley Trap include White River Spring Chinook although the majority of the run does not show up at the trap until after the winter steelhead run has finished. Listed bull trout indigenous to White/Puyallup River are passed upstream whenever trapped year around at this location. Broodstock may also be collected at the White River trap facility which is located on the opposite river bank. Broodstock origin is checked using wands to detect any coded or blank wire tags and fin marks.

Holding & Spawning

Fish will be held at the White River Hatchery in a concrete raceway/pond for ripening and spawning. The goal is that females will be spawned by hand stripping using an buffered rinse solution, held for short term re-conditioning and will be returned back to river. Males will be hand pressure spawned (sometimes more than once) and returned back to river. Moribund adults will be targeted for kidney/spleen (lethal) viral samples.

Rearing Program:

Steelhead fry are reared from hatch to yearling smolt release for approximately 12 months. Mortality can occur in association with fish culture activities and conditions which affect fish health and development, from handling procedures, fertilization procedures, water temperature, water quality, water flow, feeding success, and transport.

Operation of Hatchery Facilities:

Potential facility operation impacts on listed fish include; water withdrawal, hatchery effluent, and intake compliance or barrier blockages. Monitoring and maintenance are

conducted along with staff observations at all Co-Manager facilities. Effluent at outfall areas is rapidly diluted with main stem flows and operation is within permitted NPDES guidelines. 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).

Monitoring:
Baseline DNA sampling for steelhead trapped and trucked above Mud Mountain Dam occurs at an annual rate of 100% annually. Currently, fish are scale sampled, electronically sampled, DNA sampled, sexed and length measured prior to transport. Broodstock used for the hatchery program will be DNA sampled. DNA collection will consist of a caudal fin section removed during the time fish are length, sexed and scale sampled.

Fish Health Activities (Viral Sampling):
Females and males will be live spawned and as many possible released back to stream. Females' ovarian fluid and mucus from skin are viral sampled. Males milt and mucus from skin are viral sampled.

Actions potentially causing incidental take of listed fish:

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

Interactions may be derived from monitoring in the lower Puyallup River at the smolt trap located at river mile 10.6 though the location is upstream from the White River confluence. Wild steelhead juveniles are captured at the trap from February through June and peak in May. Wild Chinook peak catches at the trap occur in May.

Predation: In 2009, wild and hatchery steelhead captured at the smolt trap had mean fork lengths of 185mm and 184mm, respectively. For wild steelhead, the length frequency range was 102 mm to 250 mm (Berger et al. 2009). During the peak wild steelhead migration by at the trap in May, wild Chinook lengths ranged from 60 mm to 80 mm. White River Hatchery releases steelhead in April at 5-7 fish per pound which is approximately the 200 mm range.

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 White River Hatchery steelhead releases should have no predation impacts on migrating wild steelhead. There may be some predation on fingerling Chinook though this has not been documented.

Competition / Niche Displacement: White River winter steelhead released from hatcheries may compete with wild steelhead and fall Chinook for food and space in the freshwater, estuarine, and marine environment through both direct and indirect means. Returning adult steelhead from program production may also compete with naturally produced steelhead for mates and spawning sites. The risk of competition in freshwater has been minimized by feeding transfer diets (higher salt content) and release strategies that promote rapid seaward migration. Early marine life competition between the hatchery and wild juveniles is unknown. The risk of competition by adults from this program has been minimized by a fully integrated program.

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

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

Broodstock Collection: Thirty-five fish were targeted for broodstock collection annually beginning in 2006. Prior to 2008, all fish were targeted for lethal viral sampling. All adults were live spawned, temporarily re-conditioned and released back to stream. WDFW escapement reports indicate 1 holding mortality each in 2007 and 2008 from this program. Mortality resulting from broodstock collection at the Buckley trap is rare due to cool water temperatures and relatively un-crowded brail conditions during the steelhead return period.

Table 2.2.3.1. Number of White River steelhead broodstock collected and mortalities experienced from 2006-2012.

Brood Year	Females Collected	Males Collected	Female Pre-Spawning Mortality	Male Pre-Spawning Mortality	Percent Pre-Spawning Mortality	Lethal spawn/or viral sampling
2006	12	14	1		.038	25
2007	13	14	1		.035	27
2008	12	12	0	0	0	0
2009	9	10	0	0	0	0
2010	10	10	0	0	0	0
2011	11	11	0	0	0	0
2012	12	12	0	0	0	0

Rearing Program:
Take has been defined as number of broodstock. The first two years of the program, rearing mortality of eggs, fry, fingerling & sub-yearling stage cumulatively ranged up to 40% of the green egg take with significant green egg to hatch (fertilization) issues having been experienced. Once fish reach advanced fingerling stage, mortality was significantly less. In future years, it is anticipated that fish culture practices will result in increased survival from green egg to smolt stage. Artificial egg to smolt survival is assumed to be considerably greater than natural wild egg to smolt survival.

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. No mortalities to listed fish can be estimated as a result of hatchery facilities.

Monitoring Activities:
Broodstock for the hatchery program will be DNA sampled. Some fish live spawned and released back to stream (mostly females). DNA samples (caudal fin clip) should not result in mortalities and none are observed by staff. Some visual tag may be applied to re-conditioned spawners for short term monitoring. Mortality from the adult trapping, transport, data and DNA (caudal fin clip) collection is rare due to the cooler water and relatively uncrowded brail conditions at this time. Sub-yearlings are 100% blank wire tagged with loss from tagging to be significantly < 1%. Blank wire tags will be used to monitor hatchery releases upon their return as adults through wanding or similar detection method.

- Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

See Take Table 1 at the end of the HGMP. Take Tables do not include daily Buckley Trap and haul operations involving the capture or transport of listed fish to be passed upstream of Mud Mountain Dam (USACE).

- 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.

Viral sampling strategies are being reviewed in order to meet Co-Manager Fish Health Policy and to minimize the lethal take of wild steelhead genetic components to the

Puyallup River system. Any disease concerns may require 100% lethal sampling of all broodstock per Co-Managers Fish Health Policy.

The White River technical committee will meet twice annually to review the program including ways to increase green egg to smolt survivals therefore reducing the green egg take goal.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

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

N/A

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates. *Indicate whether this HGMP is consistent with these plans and commitments, and explain any discrepancies.*

The White River winter steelhead hatchery program operates under a Memorandum of Understanding between the Puyallup Tribe of Indians (PTI), the Muckleshoot Indian Tribe (MIT) and the Washington Department of Fish and Wildlife July 5, 2006 entitled *Naturally Spawning Winter Steelhead Pilot Project - White River*. The MOU agreement anticipated that the pilot program would continue for 8 brood years, with egg takes occurring from 2006 through 2013. Decisions to continue, discontinue, or expand the program will be based on recommendations of a technical team tasked to review the program, and if needed, to apply adaptive management strategies. In 2014, the co-managers decided to extend the pilot program on an interim basis based on program results, and to transfer all program hatchery activities to the White River Hatchery with future releases to be made from acclimation ponds in the upper White River watershed. The last adult returns from the 2013 brood year are expected in 2016-17. The co-managers will convene a technical team meeting in 2016 to review the pilot project data and operations to date, and decide whether to continue, modify, or terminate the program.

In addition, 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 Puget Sound Steelhead Harvest management Plan.

The Puget Sound Salmon Management Plan (PSSMP 1985) sets out the legal framework under which co-management of hatchery programs occurs. The PSSMP requires that WDFW and Puget Sound tribe develop Equilibrium Broodstock Documents agreeing on program goals, objectives, function, and release strategies of all hatchery programs. These Future Brood Documents are a detailed listing of annual production goals. This is reviewed and updated each spring and finalized in July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are collected.

3.3) Relationship to harvest objectives.

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

The program is a supplementation/conservation program and does not currently have a targeted harvest intent. Incidental tribal harvest may occur on extremely late returning fish in lower river fisheries targeting White River Chinook. The WRTC will review the program and apply adaptive management strategies if any harvest impact can be determined in indirect non-targeted harvest scenarios.

3.4) Relationship to habitat protection and recovery strategies.

Fish habitat in WRIA 10, the Puyallup/White river system, has been heavily impacted by anthropogenic activities in the past, resulting in the 1999 ESA listing of White River spring Chinook, Puyallup River Fall Chinook, Puyallup/White bull trout, and recently Puyallup/White steelhead. The White River, originally a tributary of the Green River, was permanently diverted into the Puyallup River nearly a century ago, and remains channelized from Auburn downstream. The lower Puyallup was also channelized and disconnected from its floodplain. Wood was removed wholesale, as were riparian areas, and little high quality habitat remains in the lower reaches of these rivers today. Upstream, hydroelectric projects were built on both the Puyallup and White early in the last century, the project on the Puyallup completely blocked anadromous access at Electron until a fishway was built in 2006, but it still entrains most of the flow and outmigrating smolts through an unscreened inlet, bypassing 10 miles of productive rearing area and requiring stressful hand removal of fish at the Lake Kapowsin stilling basin. This remains a major limiting factor to Puyallup River fish recovery.

The Buckley Diversion/Mud Mountain Fish Passage Barrier Dam (RM 24.3, 1911) and the Mud Mountain Dam (RM 29.6, 1942) impede upstream passage and downstream smolt migration to and from the Upper White River. Smolts have experienced passageway problems through Mud Mountain Dam. The USACE Buckley Fish Trap is inadequate to pass all the fish upstream during large return years, and especially during mass returns of pink salmon. As a result, fish are delayed, many lose energy and cannot spawn successfully, and many simply die before they can be transported, either from delay, from injuries sustained fighting the diversion structure, or on the diversion structure itself, from being trapped while trying to get over the structure.

Principal limiting habitat factors within WRIA 10 include loss of off-channel and floodplain habitat, altered flow regime, poor fish passage, riparian function, estuarine habitat, and habitat complexity. The Puyallup estuary has been dredged and filled over the years to the point that only 2% of the historic intertidal saltmarsh, critical for salmonid early life history, remains. There are also hotspots of contamination throughout the estuary, some have been recently remediated but others remain. Stormwater carries persistent legacy chemicals like dioxin, lead, arsenic, copper, flame retardants, and others

from over a century of development and industry. While the headwaters are somewhat protected from development, being largely in public ownership, much more of the watershed has been impacted by a century of poor logging practices, urbanization, transportation infrastructure, flood control, erosion control, invasive species, and global warming.

The high-priority areas for restoration listed by Pierce County 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 levee setbacks, estuarine habitat creation, artificial barrier removal, and restoration of habitat diversity and riparian conditions in tributary streams (Pierce County, 2008). Priority habitat objectives in the Recovery Plan for White River Spring Chinook (WDFW, PTI and MIT, 1996) are increased instream flows and elimination of sediment sluicing, downramping and other hydropower impacts (achieved with hydropower project decommissioning in 2004), pollution control in Commencement Bay, floodplain restoration, restricting gravel mining and woody debris removal, improved fish passage, and improved riparian and instream diversity. The White River is glacially influenced with a high bedload, unstable channel, and turbid water during the glacial melt period. Sediment transport processes and the natural flow regime are altered by reservoir operations at Mud Mountain Dam. The reservoir inundates up to 6 miles of spawning habitat in the White River.

The hatchery program's success in rebuilding the population depends on the success of efforts by state, federal, tribal and local governments to protect and improve habitat in riparian, floodplain, forest, estuarine, and nearshore marine areas, including water quality in tributaries, mainstems, and Commencement Bay. An urgent need is for the federal government (USACE) to replace the derelict Mud Mountain Fish Passage Barrier Dam at Buckley and replace and modernize the antiquated, undersized fish trap to improve passage to the upper watershed and reduce mortality, stress, and injury of fish of adult salmonids.

Recent habitat improvements include a 2007 instream flow settlement between PTI, MIT and Cascade Water Alliance that limits water diversions to Lake Tapps and restored water to a 20 mile reach of the White River. A pipeline crossing was removed from the White River below Boise Creek, increasing access to that tributary. The Boise Creek mouth was restored and the riparian area improved. Some levee setbacks were completed in the White and Puyallup rivers and others are planned. The Forest and Fish rules have resulted in road maintenance or decommissioning on forest lands. Log jams (ELJs) were constructed in one reach of the Greenwater River, the largest spawning tributary of the White River, with a similar project planned in the Clearwater River. Funding for projects was 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. Therefore hatchery programs will be implemented to allow reduced levels of harvest until sufficient improvements in habitat parameters and productivity are achieved.

The White River has been the focus of several restoration organizations and the Co-

Managers principally for the benefit of the White River Spring Chinook stock. Several habitat and restoration actions beneficial to steelhead are defined as part of the White River Spring Chinook Recovery Plan (WDFW et al., 1996). Habitat proposed actions and restoration activities are coordinated through the WRIA 10 & 12 Lead Entity (Pierce County) consisting of county, city and local government entities along with private citizens and local restoration groups.

3.5) Ecological interactions. [Please review Addendum A before completing this section. If it is necessary to complete Addendum A, then limit this section to NMFS jurisdictional species. Otherwise complete this section as is.]

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

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

Predation and competition related effects are generally mitigated by niche separation among species, and the size and abundance of potential predators. 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).

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

In the North Pacific, approximately fifteen species of marine mammals reportedly eat salmon. Predation on salmon smolts and adults in lower rivers, estuary, and marine near-shore have been documented in beluga whales, harbor porpoise, larga seal, stellar sea lion,

California sea lion, and harbor seal. The Killer whale consumes free-swimming adult salmon in these habitats, also. In addition mink and river otter forage on salmonids in the freshwater and marine shoreline.

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

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

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

See predation discussion in section 2.

Co-occurring natural salmon and steelhead populations in local tributary areas and the Puyallup River corridor areas could be negatively impacted by program fish. Of primary concern are the ESA listed threatened salmonids: Puyallup system Chinook (spring and fall races) and winter steelhead. Other Puget Sound Chinook ESU populations and steelhead DPS populations may also be indirectly affected in nearshore and marine environments. Listed fish can be impacted through a complex web of short and long term processes and over multiple time periods which makes evaluation of this a net effect difficult.

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

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

Juvenile salmonids may serve as prey for hatchery steelhead releases in the estuary and marine nearshore.

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

A large number of species are known to utilize juvenile and adult salmon as a nutrient and food base (Groot and Margolis 1991). The White River Hatchery steelhead program will supply a source of marine derived nutrients to the watershed benefiting numerous fish, bird, mammal, invertebrate, and plant species. Pacific salmon carcasses are important for nutrient input back to freshwater streams (Cederholm et al. 1999). Nutrients will be provided by decaying hatchery return carcasses decaying from HORs on the spawning grounds and the nutrient enrichment program that distributes sampled hatchery return carcasses throughout the basin. Carcasses from returning adult salmonids have been found to elevate stream productivity through several pathways, including: 1) release of nutrients from decaying carcasses that directly stimulates primary productivity (Wipfli et al. 1998); 2) enrichment of the food base of aquatic invertebrates by decaying carcasses (Mathisen et al. 1988); and 3) direct feeding on carcasses by juvenile salmonids (Bilby et al. 1996). Bilby and Bisson (1987) have documented the positive correlations between increased freshwater productivity and increases in salmon spawning biomass and nutrient transfers. Increasing populations of other salmon species will provide additional primary productivity that may benefit both hatchery and natural Chinook fry and outmigrants. In addition, marine derived nutrients are distributed throughout the riparian zone by foraging animals.

The steelhead program could positively impact freshwater and marine species that prey on juvenile salmon. 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. While not always desired from a production standpoint, these hatchery fish provide an additional food source to natural predators that might otherwise consume listed fish and may overwhelm established predators providing a beneficial, protective effect to co-occurring wild fish.

White River hatchery steelhead smolts can be preyed upon release thru the entire migration corridor from the river subbasin to the mainstem Puyallup River and estuary. Avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and green herons. Mammals that benefit from migrating smolts (river otters), and returning adults include: harbor seals, sea lions and Orcas. While not always desired from a production standpoint, these hatchery fish provide an additional food source to natural predators that might otherwise consume listed fish and may overwhelm established predators providing a beneficial, protective effect to co-occurring wild fish. The hatchery program may be filling an ecological niche in the freshwater and marine ecosystem. A large number of species are known to utilize juvenile and adult salmon as a nutrient and food base (Groot and Margolis 1991). Wild co-occurring salmonid populations might be

benefited as hatchery fish migrate through an area. The migrating hatchery fish may overwhelm predator populations, providing a protective effect to the co-occurring wild populations. Pacific salmon carcasses are also important for nutrient input back to freshwater streams (Cederholm et al. 1999). Successful or non-successfully spawner adults originating from this program may provide a source of nutrients in oligotrophic coastal river systems and stimulate stream productivity. Carcasses from returning adult salmonids have been found to elevate stream productivity through several pathways, including: 1) the releases of nutrients from decaying carcasses has been observed to stimulate primary productivity (Wipfli et al. 1998); 2) the decaying carcasses have been found to enrich the food base of aquatic invertebrates juvenile salmonids have been observed to feed directly on the carcasses.

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.

For integrated programs, identify any differences between hatchery water and source, and "natal" water used by the naturally spawning population. Also, describe any methods applied in the hatchery that affect water temperature regimes or quality. Include information on water withdrawal permits, National Pollutant Discharge Elimination System (NPDES) permits, and compliance with NMFS screening criteria.

White River Hatchery

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. 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 wells may produce up to 1,000 gpm collectively depending on time of year and amount of drawdown of the shallow underground aquifer that feeds the wells. Surface water pumped from the White River may be blended with the well water for several weeks prior to release to prepare the fish for the glacial river environment.

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.

Due to the high turbidity of surface water, a sediment removal system has been used at times, 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 40s by late October. Midsummer 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 1,100 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, and 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 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 4/3/90 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 and use 5,000 pounds of fish food per month. If criteria change and are otherwise applicable to the Tribal hatchery, then NPDES compliance 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.
(e.g. "Hatchery intake screens conform with NMFS screening guidelines to minimize the risk of entrainment of juvenile listed fish.").

White River Hatchery has one standby well which would produce about 200 gpm in an emergency situation. The surface water intake screens conform to NMFS screening guidelines to minimize entrainment of juvenile listed fish. 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).

Adult winter steelhead to be used for broodstock will be collected at the White River USACE Buckley Trap near Buckley, Washington at RM 23.4, and at the White River hatchery trap on the opposite bank. The Buckley trap is part of the USACE ongoing trap and haul operation of all salmonids taken upstream of Mud Mountain Dam.

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

Adult steelhead are transferred in 360 gallon totes with oxygen and salt added.

5.3) Broodstock holding and spawning facilities.

Fish will be held at White River Hatchery for ripening and spawning. The goal is that females will be spawned by hand stripping using an buffered rinse solution, held for short term re-conditioning and will be returned back to river. Males will be hand pressure spawned (sometimes more than once) and returned back to river. Moribund adults will be targeted for kidney/spleen (lethal) viral samples.

5.4) Incubation facilities.

Incubation consists of 24 vertical stacks of 8 trays.

5.5) Rearing facilities.

Initial rearing uses 12 troughs in the hatchery building. Fish are reared to final stage at White River Hatchery in a 5,816 cubic foot concrete pond until released into the White River. Four by eight foot floating lattices are placed into the pond to provide shading and cover for the fish. Bird netting covers the pond to keep out predatory birds such as kingfishers and herons.

5.6) Acclimation/release facilities.

There are five acclimation ponds, four of which are earthen, and one is concrete. Periodically, one or more of the acclimation ponds are inaccessible and unavailable to due snowpack or road washouts. Yearling juveniles will be acclimated in the ponds beginning in February and released in early May.

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

No physical operational disasters have occurred.

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 is equipped with backup generators and adequate fuel supply in the event of a power outage. Personnel are on rotating standby status year around in the event of a problem. An alarm system is in place and designed to detect changes in flow and power status. Disease prevention or risk to the wild population are minimized or eliminated by Co-Managers Fish Health Policy.

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.

Wild winter steelhead adults arrive at the Buckley and White River Hatchery trap location late in the winter and through the early summer months (March – June). Spring 2006 was the first year broodstock were collected from the Buckley Trap. All broodstock will be of wild origin collected from the Buckley Trap and the White River hatchery trap on the opposite river bank.

When hatchery fish return from this program, they will have been tagged (blank wire or coded) to identify them in order to not be used as broodstock but only for Upper White River supplementation.

6.2) Supporting information.

6.2.1) History.

Past Programs in the Puyallup River System:
Hatchery augmentation of steelhead (Chambers early winter stock) has occurred in the Puyallup and Carbon Rivers since 1947. Chambers Creek stock was selected for early run time and maturation in order to produce one year smolts upon release the following spring and was planted widespread throughout Western Washington (Crawford et, al. 1979). The White River system received Chambers Creek stock plants from 1966 through 2002 (WDFW Fish Plant Database). These fish came from regional egg sources mostly from Tokul Creek or Lakewood (formally South Tacoma) Hatchery (Crawford et, al. 1979). A segregated winter steelhead program (Chambers stock) concurrently exists in the Puyallup River system with releases from Voights Creek Hatchery, a tributary to the Carbon River (See also WDFW Voights Creek HGMP).

Current Program in the White River:
The White River steelhead supplementation program began as a pilot program in 2006 with incubation and rearing occurring at Voights and Diru Creek hatcheries with final rearing and release at White River Hatchery. Only wild winter steelhead arriving late in the winter thru early summer (March – June) are targeted for broodstock usage. Hatchery fish are not utilized as broodstock. Between 2006 and 2012, up to 13 females and 14 males were utilized as broodstock each year.

6.2.2) Annual size.

Up to 15 females and 20 males will be used for broodstock in this program. Partially ripe females may be live spawned and returned back to the river. The program will be operated to limit the total wild broodstock collection to no more than 20% of the wild escapement reaching the White River at the USACE Buckley trap for any year. The

collection of the maximum 35 broodstock represents approximately16% of the average annual NOR return at the USACE Buckley Trap for the period 2003 -2012 (see Table 2.2.2.3). Annual broodstock collection in this program since its 2006 initiation has averaged 9% of all NORs arriving at the Buckley trap (range 7% to 12%), and a smaller fraction of the total NOR return to the upper and lower river combined.

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

This is an integrated recovery program with 100% wild fish used as broodstock.

6.2.4) Genetic or ecological differences.

Broodstock will be wild adults representative of the historical genetic structure of the White River winter steelhead population. Early winter stock (Chambers stock) adults encountered at Buckley Trap in the late winter (Feb) would be excluded for use and transported to Voights Creek hatchery.

Allozyme analysis of Puyallup winter steelhead sampled in 1994 clusters them with winter steelhead in the Cedar, Green and White Rivers and with some Snohomish basin steelhead (Phelps et al. 1997). White River steelhead adults were not sampled, but will be included in future DNA collections to update genetic makeup of steelhead stocks in Puget Sound. Genetic samples (fin clips or scale samples) will be collected from White River collected broodstock adult and preserved in alcohol for future genetic analysis (population structure and genetic variation).

Chambers Creek stock hatchery fish typically return from late November through early February, while their wild counterparts may range from November through June although the wild winter steelhead are trapped at the Buckley trap from March on (**see** HGMP **Section 7.2**). Peak early Chambers spawning is in January, while peak wild winter spawning occurs from late April on. Hatchery steelhead will be released as age 1+ smolts whereas wild steelhead exhibit a more variable life histories including predominately (89%) age 2+ freshwater smolts and increased ages of marine residency time before first spawn (WDFW 1994, Status Review Update for Puget Sound Steelhead, 2005 Puget Sound Steelhead Biological Review Team).

6.2.5) Reasons for choosing.

Indigenous stock native and adapted to the Upper White River.

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.

Protocols are in place to eliminate any possibility of non-local Chambers stock from the program by trap timing (arrival prior to March of the year) and individual identification including a partial or full adipose fin clip.

When hatchery fish return, they will have been blank wire tagged that will allow identification from Chambers stock or wild fish. They will be used for supplementation above Mud Mountain Dam and not for broodstock.

Broodstock collection will be limited to 50% of the adults entering the trap in any one day not to exceed a maximum of 6 adults (sexually balanced when possible) per day. The program will be operated to limit the total wild broodstock collection to no more than 25% of the White River wild escapement reaching the Buckley trap for any given year.

Individuals demonstrating ripeness will be given preference for transport in order to reduce holding time impact needed to ripen wild broodstock.

Adults will be collected over the entire portion of the run as much as possible although extremely late arriving and ripening fish may be excluded due to the difficulties of achieving one year smolt goals.

Broodstock live spawn, re-conditioning and return back to stream strategies are being investigated in order to return as many fish back to wild as possible for repeat spawner potential. These fish may also contribute some eggs or milt to the current year spawning.

SECTION 7. BROODSTOCK COLLECTION

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

Adults

7.2) Collection or sampling design.

Wild steelhead are targeted based on time of arrival (March – May) and adipose fin presence when arriving at the Buckley Trap. Attempts will be made to collect broodstock over the entire portion of the present run. If earlier run segments re-colonize in future generations, they will be incorporated into the selection process based on the ability to ensure they are indigenous.

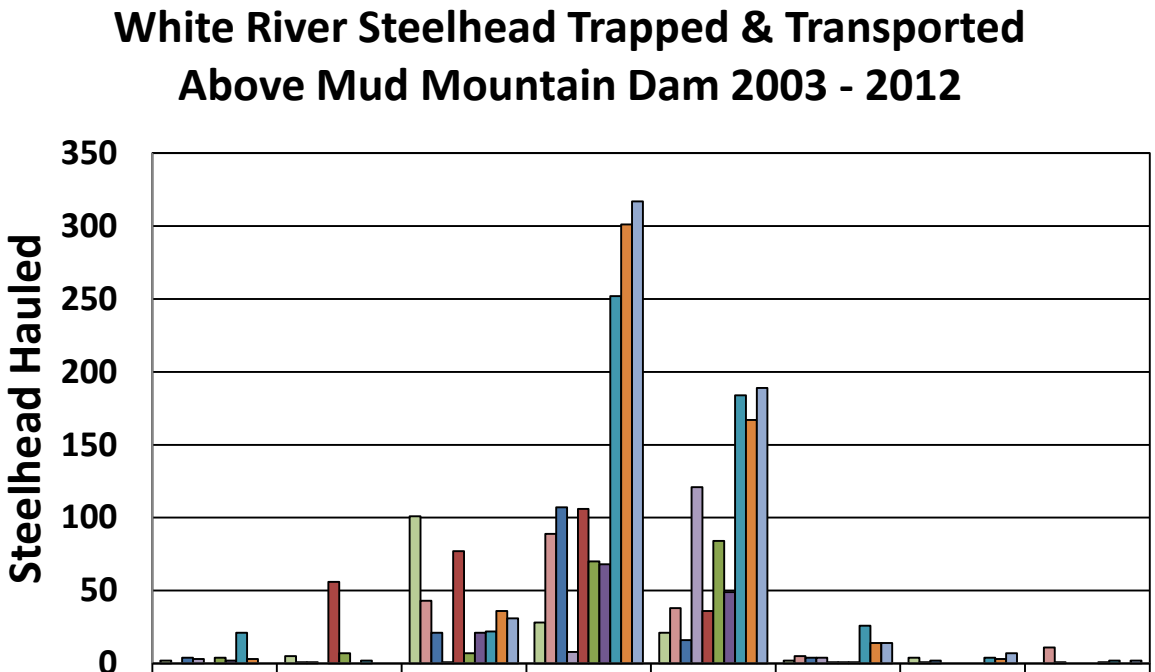
Less than 5% of the wild fish arrive at the Buckley Trap prior to March (**Graph 1**). Individuals demonstrating ripeness when trapped will be given preference for transport over extremely unripe (green condition) in order to avoid protracted holding periods (and possible mortality) at White River Hatchery. Up to 50% of the adults entering the trap in any one day can be transported, however, not to exceed a maximum of 6 adults (sexually balanced when possible) per day. Adults are held in gender-separate circular rearing tanks except that one male steelhead will be held with the females to help accelerate the maturation process.

Broodstock collection will be adjusted in low return years as necessary to insure that the total wild broodstock collection is no more than 30% of the wild escapement in the White River system for any given year.

7.3) Identity.

Fish arriving from March on and having a full adipose fin are targeted for collection at the Buckley Trap. Fish will be electronically sampled for wire tags to insure that they are not hatchery fish.

Stray hatchery fish identified by an adipose fin clip and early winter timing (Nov – Feb) of possible Voights Creek hatchery origin (Chambers stock) may be trapped at this location but are not passed upstream. They will be transferred to Voights Creek Hatchery for use in the segregated hatchery program or for removal from the system.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
2003	2	5	101	28	21	2	4	0
2004	0	1	43	89	38	5	1	11
2005	4	1	21	107	16	4	2	1
2006	3	0	1	8	121	4	0	0
2007	0	56	77	106	36	1	0	0
2008	4	7	7	70	84	1	0	0
2009	2	0	21	68	49	1	0	1
2010	21	2	22	252	184	26	4	2
2011	3	0	36	301	167	14	3	0
2012	0	0	31	317	189	14	7	2
2013	4	14	34	277	188	16	1	4
2014	5	15	105	189	119	10	11	0
Total by Month	48	101	499	1812	1212	98	33	21
Trap % by Month	1.3%	2.6%	13.0%	47.4%	31.7%	2.6%	0.9%	0.5%

Figure 7.3.1. Steelhead trapped by month at Buckley Trap from 2003 -2014 (USACE, Mud Mountain Fish Trap Website). Note: less than 0.3% return monthly September through December.

7.4) Proposed number to be collected:

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

Maximum of 15 females and 20 males. Egg take goal is 48,000 green eggs (maximum 60,000)

7.4.2) Broodstock collection levels for the last twelve years or for most recent years available:

Table. 7.4.2.1 White River wild winter steelhead broodstock collection (2006-2012).

Brood Year	Females	Males	Jacks/comments	Green Egg Take
2006	12	14	Broodstock held at Voights Creek. All lethally spawned with 1 mortality.	47,000
2007	13	14	Broodstock held at Voights Creek. All lethally spawned with 1 mortality.	58,000
2008	12	12	Broodstock held at Diru Creek. All live spawned.	38,508
2009	9	10	Broodstock held at Diru Creek. All live spawned.	28,881
2010	10	10	Broodstock held at Diru Creek. All live spawned.	32,090
2011	11	11	Broodstock held at Diru Creek. All live spawned.	35,299
2012	12	12	Broodstock held at Diru Creek. All live spawned.	28,881

Data source: Puyallup Tribal Fisheries.

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

Upon return, hatchery returns would not be considered for broodstock and will be hauled above Mud Mountain Dam for Upper White River supplementation.

7.6) Fish transportation and holding methods.

Adult steelhead will be sampled for sex, length, scales, and DNA then transferred in 360 gallon totes with oxygen and salt added from the USACE Buckley Trap to the White River hatchery. The drive takes ~10 minutes. Similarly, fish will be transported by tote from the White River Hatchery trap (on the opposite river bank) to the holding ponds a few hundred yards from the trap. Adults will be held in an outdoor concrete rearing pond

until spawned. Formalin is dripped (1/6000) three days a week on the adults while in the holding pond.

7.7) Describe fish health maintenance and sanitation procedures applied.

Adults will be treated with formalin and salt to control fungal development. Moribund adults will be targeted for kidney/spleen (lethal) viral samples.

7.8) Disposition of carcasses.

All fish are live spawned and returned to the river except fish killed for viral sampling protocols. In the event of a mortality, virology samples are taken and the carcasses are used for enhancement in the White River.

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.

Broodstock in good physical condition will selected for broodstock transport. Fish with physical injuries from concrete or metal would not be considered and placed upstream.

The goal will be to collect broodstock from throughout the (currently existing) natural run period to provide for random selection of adults from the entire adult population. This would include earlier historical run segments of the run if they occur in the future.

Up to 50% of the adults entering the trap in any one day can be transported, however, not to exceed a maximum of 6 adults (sexually balanced when possible) per day.

Operational guidelines for collection of broodstock, indicates that for wild populations having 150 fish or more to try and limit collection of wild broodstock to 30% of the population (HSRG 2004). Although the White River escapement at Buckley Trap has decreased to approximately 200 in recent years, the total maximum number of broodstock (47) planned is 20% of the wild population of the average monitored. Additional White River steelhead production may occur in the lower White River (below Buckley Trap) and other tributaries (Boise Creek). In order to limit collection of wild broodstock to within 30% of the population, broodstock collection will be reduced during years when wild steelhead counts are low relative to the past 10 years historic trap data.

SECTION 8. MATING

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

8.1) Selection method.

Wild fish from the Buckley trap and White River traps are selected randomly from the entire run timing and are transported to the White River Hatchery. From there, ripe fish are selected and spawned. If fish captured at the trap are in a ripened condition they may be used to substitute for unripe fish being held at the hatchery.

8.2) Males.

Additional males may be used as a backup if the primary male milt was not sufficient. Males may be live spawned until completely spent after which they may be killed for viral sampling (kidney/spleen).

8.3) Fertilization.

Females will be spawned by hand stripping using an buffered rinse solution , held for short term re-conditioning and will be returned back to river. Males will be hand pressure spawned (sometimes more than once) and held on station. Matings will be a 2 x 2 factorial when possible to increase genotypic diversity. Since spawn cohorts on a given day may be small sometimes only 1 pair, some crossings will be 1:1 pairings although an additional male may be used as a backup if the primary male milt was not sufficient. Eggs will be iodine disinfected. All females will be ovarian fluid sampled, and as many adults as possible will be kidney/spleen sampled per Co-Managers Fish Health Policy.

8.4) Cryopreserved gametes.

NA

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

A 2 x 2 factorial mating scheme will be applied to reduce the risk of loss of within population genetic diversity for the small steelhead population that is the subject of this supplementation program.

After fertilization, eggs are rinsed in a buffered iodine solution (100 ppm) to control viral and bacterial disease, and allowed to water harden for one hour in the same solution.

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.
Provide data for the most recent twelve years, or for years dependable data are available.

Not available at this time

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

No surplus egg takes are anticipated.

9.1.3) Loading densities applied during incubation.

Flows per incubator are 5 gallons per minute (gpm) and temperatures are between 48 and 50^{o}F. One female is utilized per tray of vertical incubators (8 trays per stack) to reduce disease risk (isolated incubation). Eggs per pound have ranged from 2,141 to 3,243.

9.1.4) Incubation conditions.

The top tray is used for settling of silt and organics while the eggs are put in the bottom trays.

9.1.5) Ponding.

Button-up fry are ponded at 1,060 cumulative temperature units (TUs) in the month of June at approximately 1,750 fish per pound (fpp).

9.1.6) Fish health maintenance and monitoring.

Eggs will be incubated in the smallest practical lots so that a positive viral finding will impact the minimal number of eggs. Eggs receive formalin drip treatments for fungus prevention. Incubation, fry, fingerling, sub-yearling through yearling stages are managed per Co-Managers Fish Health Policy.

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, or for years dependable data are available.

Table. 9.2.1.1. White River wild steelhead program egg to smolt survival rates.

BY	Egg Take	Outplants	Survival
2006	47,000	25,631	54.53%
2007	58,000	56,378	97.20%
2008	38,508	31,531	81.88%
2009	28,881	26,310	91.10%
2010	32,090	27,876	86.87%
2011	35,299	31,129	88.19%

Source: Puyallup Tribal Fisheries

Average survival rate from fingerling to smolt at Diru Hatchery is 99.6%.

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

Targets for rearing densities and loading are dependent on fish size and will be as follows:

500-1800 fpp: 0.5 lb/ft^3, 2 lbs/gpm (maximum threshold)
10-500 fpp: 0.75 lb/ft^3, 6 lbs/gpm (maximum threshold)
5-10 fpp: 2.0 lb/ft^3, 10 lbs/gpm (maximum threshold)

9.2.3) Fish rearing conditions

Steelhead fry are reared from hatch to yearling smolt release for approximately 12 months. Temperatures range from 45° – 50° F. Influent DO is approximately 12 ppm, effluent is approximately 7 ppm.

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

Table 9.2.4.1. White River Hatchery steelhead growth for BY 2007-2011.

	March Averages		April Averages		Release Averages	
BY	Weight (fpp)	Length (mm)	Weight (fpp)	Length (mm)	Weight (fpp)	Length (mm)
2007	14.7	139	12.1	149	7.6	176
2008	16.4	130	12.1	149	7.5	179

2009	12.9	143	11.5	147	8.2	175
2010	12.9	144	11.5	149	8.3	171
2011	18.2	129	14.6	138	8.2	173

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

Information is not available at this time.

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*).

Fry are fed BioVita Starter once per hour, 8 hours a day, 7 days a week. Fingerlings on site fed Bio-Vita with reduced frequency every two hours, 8 hours a day, 7 days a week. Feeding frequency and amount is based on BioOregon's recommendation for Bio-Vita at prevalent water temperatures.

Yearlings are fed Bio-Vita Fry until satiation 5 days a week. Approximately 6 weeks prior to release, they are fed BioSupreme which is thought to increase smoltification due to higher salt content. Feeding amount is based on targeted fish size at time of release, usually 1% BW/day (condensed to 5 days per week) and adjusted accordingly. Feed conversion rate ranges from 0.8 to 1.1 for yearlings.

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

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

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

None.

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

NA

9.2.10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation. (*e.g. "Fish will be reared to sub-yearling smolt size to mimic the natural fish emigration strategy and to minimize the risk of domestication effects that may be imparted through rearing to yearling size.")*

Releases will be at the yearling smolt stage during the late spring release period.

Yearling smolts will be released at a target size of 7.0 fish per pound or greater to maximize survival, but if due to colder water temperatures and late egg takes (May/June), they may be released at a smaller size similar to wild smolts observed in the White and neighboring Green River system (See HGMP section 10.1 also).

SECTION 10. RELEASE

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

10.1) Proposed fish release levels.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Yearling	60,000	7.0	May	White River tributaries upstream of Mud Mt Dam (acclimation ponds)

The target size at release for White River smolts is 7.0 fpp in order to maximize survival although due to late steelhead potential spawners, the program may not reach the target size especially in colder years and releases may be of smaller sizes. Sizes may be similar to wild smolts from the White River based on two years WDFW smolt monitoring data. A subsample of steelhead smolts from 2000 and 2001 averaged 192 mm fl (7.1 fpp) and 195 mm fl (6.8 fpp) with smolt emigration from the system complete by early June (Figure 10.1.1). Calculated weight is based on a .9 condition factor (K) respectively for those average lengths. Based on the wild smolt emigration data, releases may occur later in June and colder water temperatures such as occurring in spring 2008 may shift that window even later in the month.

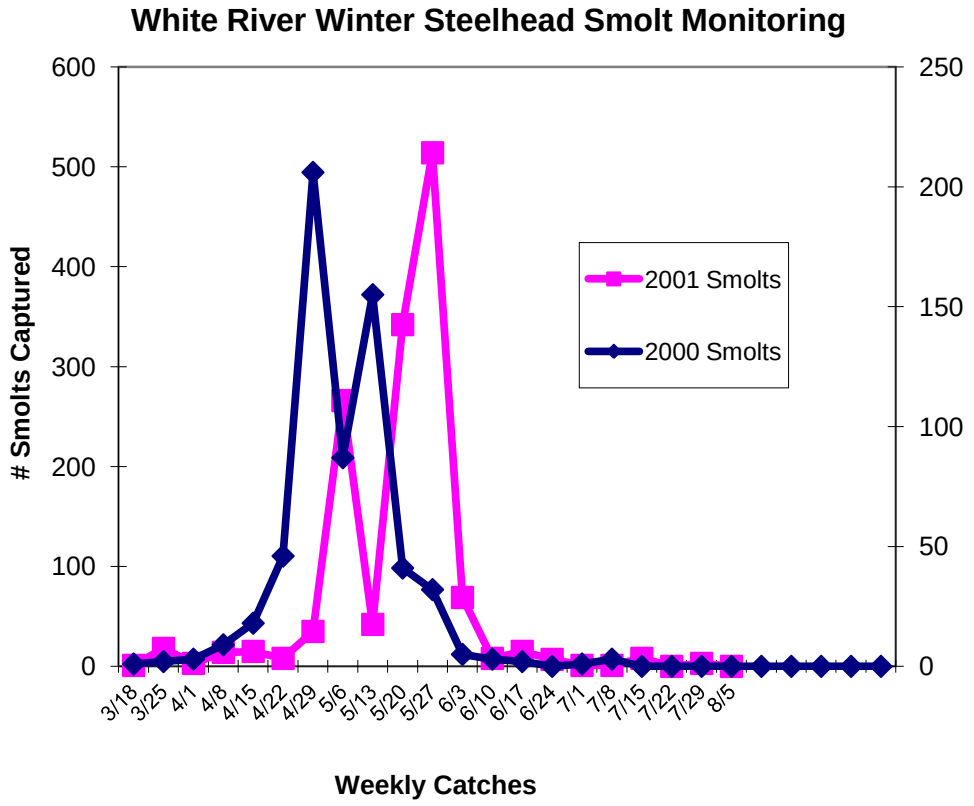


Figure 10.1.1. 2000 and 2001 Smolt Emigration from the White River (WDFW Wild Smolt Monitoring Data, Topping, P., 2008).

In the neighboring Green River system (WRIA 9), wild smolts have been intensively monitored by WDFW, with the average wild steelhead smolt for the past 7 years averaging ~159 mm fl - Table 7, (2000 – 2006 Green River Juvenile Salmonid Production Evaluations, Volkhardt, G., Fleischer, L., Topping, P., Kishomoto, L.). An average weight was calculated by applying a 0.9 condition factor (K) to the average length.

Table 10.1.1. Green River Wild Steelhead Smolt Lengths

Year	Avg. Length	Cal. Avg. Wt./ffp
2000	176	9.2
2001	167	11.0
2002	173	9.8
2003	148	15.6
2004	153	14.1
2005	151	14.6
2006	145	16.5
Total Avg.	159	12.6

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

Stream, river, or watercourse: White River (10.0031)

Release point: Upper White River tributary acclimation sites to be determined/ or as accessible: Huckleberry Creek ("Army") Rearing Pond located at Mile 0.5 on Huckleberry Creek (10.0253); Huckleberry Creek ("Aerial") Rearing Pond located at Mile 4.8 on Huckleberry Creek (10.0253); Greenwater Rearing Pond located at RM 11.2 on the Greenwater River (10.0122); Twenty-eight Mile Creek (10.0129) on the Greenwater River; and Jensen Creek Rearing Pond located at RM 2.3 on Jensen Creek (10.0082) in the Clearwater River, Puyallup/White River Basin, Washington State.

Major watershed: White River basin (WRIA 10)

Basin or Region: Puget Sound

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

Table 10.3.1. Program releases and size, 2007-2012.

Release year	Yearling	Average size	Date
2007	25,631	6.7 fpp	June 5
2008	56,378	7.6 fpp	May 23
2009	31,531	7.5 fpp	May 28
2010	26,310	8.2 fpp	May 26
2011	27,876	8.3 fpp	May 23
2012	31,129	8.2 fpp	June 8

Source: Muckleshoot Indian Tribe Fisheries (White River Hatchery)

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

In the past, fish were forced released from White River Hatchery. See table 10.3.1 for actual release dates. Beginning in 2014, they were released from acclimation ponds in the upper watershed.

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 (*methods applied and length of time*).

Fish are transported to the upriver acclimation ponds in February and released at the end

of 8 weeks. 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.

All smolts will be blank wire or coded wire tagged to identify hatchery adults upon return at the Buckley Fish trap and at other locations in the Puyallup river system, and to differentiate White River Hatchery steelhead releases as needed from any PTI upper river acclimation releases. Marking will occur at the White River Hatchery.

The Voights Creek Hatchery segregated winter steelhead program releases 100% mass marked fish (adipose fin clipped, not blank wire tagged) and can be distinguished from the White River fish throughout the system (See also Voight Creek Winter Steelhead HGMP).

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

No surplus is expected.

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 the event of catastrophic water failure fish would be released early or moved to another facility if possible.

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

Fish will be released as yearlings, monitored for smolting behavior, and fed specialized diets prior to release in order to foster rapid emigration throughout the system.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10. See table in Section 1.10

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

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

The ability to estimate such indicators will be determined by implementation plans, budgets, and assessment priorities. Many indicators will be provided by the current operations at Buckley Trap. Costs for increased DNA collection and running those samples will need to be identified.

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.

Adult steelhead will be sampled at the Buckley Trap (and White River trap) upon arrival. Steelhead will be hand dipped and placed in a container and anesthetized with MS 222 before sampling and subsequent transfer above Mud Mountain Dam.

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****. If applicable, correlate with research indicated as needed in any ESU hatchery plan approved by the co-managers and NMFS. Attach a copy of any formal research proposal addressing activities covered in this section. Include estimated take levels for the research program with take levels provided for the associated hatchery program in* ***Table 1****.*

12.1) Objective or purpose.

Mud Mountain Dam (MMD) is a U.S. Army Corps of Engineers earthen flood control dam and recreation facility on the White River in western Washington. The dam was originally constructed in the 1930s and 40s (completed 1948) with the sole purpose of providing flood control ability on the White River. The White River originates from glaciers on Mt. Rainier and flows generally westward into the Puyallup River near Sumner, Washington and eventually drains into Commencement Bay in Puget Sound. The White River is approximately 68 miles in length. Mud Mountain Dam is located approximately at the halfway point, 30 miles upstream from the confluence of the White and Puyallup Rivers near the city of Enumclaw, Washington.

Mud Mountain Dam was originally designed with two concrete tunnels to pass both water and fish around and under the dam; a 9-ft-diameter tunnel (elev 895 ft msl), and a 23-ft-diameter tunnel (elev 910 ft msl). The 9-ft tunnel is the primary passage route for normal flows and the 23-ft tunnel is generally used during periods of elevated discharge levels or flood events. Water control for the 9-ft tunnel is provided at the upper end of the tunnel by a single radial gate. The tunnel is lined with a one-inch steel plate that covers the tunnel floor and extends approximately three feet up the sidewall. The 9-ft tunnel is 1,694 feet long and discharges at water level into the natural canyon alignment. Fish passing through the 9-ft tunnel enter the river at grade in the thalweg downstream of MMD. This tunnel can carry a discharge of approximately 2,000 cfs before filling completely, at which point flows become pressurized.

Due to the high levels of sediment and bedload, combined with unique hydraulic conditions, the 9-ft tunnel has experienced extensive wear of the steel liner. Holes in the steel plate have formed and wear of the concrete at those locations occurs regularly. Replacement of the steel liner is needed for a long-term solution but will not necessarily provide a permanent solution to the problem. Monitoring the success of these improvements in relation to species protected by the Endangered Species Act is stipulated by the U.S. Fish and Wildlife Service and National Marine Fisheries Service in the Biological Opinion for Mud Mountain Dam. Beginning in 2011, R2 Resource Consultants was contracted by the U.S. Army Corps of Engineers to assist in the preliminary analysis of the passage of salmon smolts through the MMD tunnels. This study was implemented to determine juvenile salmonids passage through the 23-ft tunnel (2011) and 9-ft tunnel (2012) at Mud Mountain Dam. Study results indicated a fish passage problem with the 9-ft tunnel for reasons that may have been associated with

study conditions. Therefore, it is anticipated that this research will be repeated in the next several years as an outcome of Mud Mountain Dam Section 7 ESA consultation.

12.2) Cooperating and funding agencies.

This study was funded by the U.S. Army Corps of Engineers, Seattle District.

12.3) Principle investigator or project supervisor and staff.

Eric Jeanes – R2 Resource Consultants, Inc., (425) 556-1288
Charles Ebel – U.S. Army Corps of Engineers, (206) 764-3626
Fred Goetz – U.S. Army Corps of Engineers, (206) 764-3515

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

Puget Sound steelhead were listed as threatened under the Endangered Species Act in 2007 (72 Federal Register 26722). The Puget Sound steelhead distinct population segment includes all naturally spawned anadromous winter-run and summer-run *Oncorhynchus mykiss* (steelhead) populations, in streams in the river basins of the Strait of Juan de Fuca, Puget Sound, and Hood Canal, Washington, bounded to the west by the Elwha River and to the north by the Nooksack River and Dakota Creek, as well as the Green River natural and Hamma Hamma winter-run steelhead hatchery stocks. A status review was issued in 2011 that indicated White River steelhead should remain listed as threatened under the ESA (76 Federal Register 50448).

Juvenile steelhead (age-1+) smolts were selected as the test specimens for the evaluation of juvenile fish passage through Mud Mountain Dam. Test fish were progeny of wild broodstock. White River steelhead smolts were selected because of their similarity to wild steelhead populations, availability, and body size at onset of study period. Test fish were the progeny of wild (i.e., unmarked) brood stock captured at the Buckley Trap. After capture, adult broodstock will be transferred to the White River Hatchery and held in hatchery ponds until they reach ripe condition. Adult steelhead were live-spawned using the sodium bicarbonate method and were reared at the Diru Creek facility for one year when they are transferred to the White River Hatchery for release. Approximately 35,000 yearling smolts (all containing CWT) were batch-released annually into the White River downstream of the Buckley Dam. Test specimens for this study were randomly selected from the batch release of broodstock that occurred in June 2011 and 2012. During this time, the test fish resided in hatchery raceways located at the Muckleshoot Hatchery near Buckley.

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

Steelhead smolts were randomly selected ($N = 60\ year^{-1}$) from the White River Hatchery raceways to be used as test specimens for the study. Smolts were moved to darkened

raceways located inside the hatchery building one week prior to surgical implantation. Test fish were supplied with White River water during their entire residence at the White River Hatchery. Twenty-four hours prior to surgical implantation, hatchery rations were eliminated. Test fish were also withheld rations for 24-hrs following surgical implantation of transmitters. Based on previous studies conducted in the White-Puyallup River Basin on juvenile salmonids and bull trout, acoustic transmitters (Vemco, Inc., Shad Bay, Nova Scotia) were selected to tag fish for this study. When activated, the V7-4L transmitter (22.5 mm-long X 7 mm-diameter, 1.0 g) was programmed to transmit for one day, shut off for 7 days, and then turn on again for 80 days at a nominal pulse rate of 45 seconds (25 sec min., 65 sec max.). All fish handling procedures utilized sanctuary aquarium nets, 3 mm-diameter nylon-knotless dip nets, darkened and covered containers, and water supplemented with Stress Coat™ (Mars Fishcare, Chalfont, PA) to reduce handling stress to test fish.

Individual test fish were randomly selected from the test fish batch, anesthetized in a container (87 L) filled with water and buffered tricaine methane-sulfonate (Finquel®/MS-222, Argent Chemical, Redmond, WA) bath at a concentration of 80 mg L^{-1} until they became immobile. Each fish was prepared for surgery, weighed (to nearest 0.1 gm), and measured (to nearest 1.0 mm fork and total length). Steelhead smolts with fin damage, wounds, or other physiological damage were not selected as test specimens and were returned to the batch group. Test fish were placed on a foam-rubber pad and supplied with a maintenance dose of anesthesia (40 mg L^{-1}). An incision (4 mm long) was made lateral and parallel to the linea alba, anterior to the pelvic girdle. The acoustic transmitter was placed inside the peritoneal cavity and the incision was closed with two or three simple interrupted sutures (Ethilon non-absorbable with FS-2 reverse cutting point needle) and secured with a reinforced surgeons knots and one drop of VetbondTM (3M, St. Paul, MN) tissue adhesive. After implantation, the test fish was placed in a darkened, covered recovery container (19 L) until upright and swimming. Each surgical implantation required less than 40 sec from the time that the test fish was removed from the anesthetic to placement in the recovery container. After recovery, test fish were transferred to a darkened, covered fiberglass hatchery raceway (1.2 m-wide X 4.9 m-long) where they resided until their release date. Mean fork length and weight of fish were 175.8 mm (±14.1 mm std. dev.) and 60.9 g (±16.0 g std. dev.); mean tag burden was 1.74% (±0.40%).

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

Juvenile steelhead smolts were moved to darkened raceways located inside the hatchery building ten days prior to surgical implantation. Juvenile steelhead test fish were implanted one week prior to their release. Juvenile steelhead smolts were released on 15 June 2011 and 11 June 2012. Juvenile steelhead were "recaptured" using an existing array of automated submersible fixed acoustic receiver stations (Vemco VR-2 69-kHz ultrasonic receiver) that were deployed in the White River Basin to monitor native char and juvenile salmonids downstream movement to Puget Sound. Supplemental receiver locations were strategically added to the existing fixed receiver array at locations with

documented levels of elevated of detection rates. In total, the White-Puyallup Basin contained 18 fixed receivers; additional receiver locations were installed in Puget Sound at West Point and Mukilteo (20 total receiver locations).

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

One day prior to their release date, test fish were monitored with Vemco portable acoustic receiver (VR 100 ultrasonic tracking receiver) to determine that all tags had re-initiated transmission. Test fish were transported to MMD in darkened, covered, aerated containers (87 L) at 0600 (PDT) hrs on 15 June 2011 and 11 June 2012. Test fish were interrogated with Vemco portable receiver and randomly assigned into one of two live cages (0.6 m-wide X 0.6 m-deepX1.2 m-long; 3 mm mesh) that were located in the MMD forebay. Test fish resided in the live cages until sunset (2000 hrs PDT) when they were transported to their release location. One test fish group (N=30) was released upstream from MMD and one test fish group (N=30 test fish) was released immediately downstream from MMD during each study season. Test fish groups were conducted at sunset to minimize predation and maximize fish acclimation. All fish handling procedures utilized sanctuary aquarium nets, 3 mm-diameter nylon-knotless dip nets, darkened and covered containers, and water supplemented with Stress Coat™ (Mars Fishcare, Chalfont, PA) to reduce handling stress to test fish.

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

We did not experience mortality within the test fish release groups during any of the study years.

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

Our test utilized 60 steelhead smolts (juvenile, no sex determined) during each study year (2011 and 2012) for a total of 120 age-1+ steelhead smolts. No mortalities occurred during either study year.

12.10) Alternative methods to achieve project objectives.

White River steelhead smolts were selected as the study specimens by the U.S. Fish and Wildlife Service and National Marine Fisheries Service. The White River broodstock smolts are the only stock that was available and of appropriate size for this study.

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

No other fish species were handled during this study.

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.

Surgical procedures followed the peer-reviewed methods generally described in Ross and Kleiner (1982); McLeod and Clayton (1997); Swanberg (1997); Mogen (1999); Hall et al. (2009); Deters et al. (2010); and Deters et al. (2012). Test fish were transported to MMD in darkened, covered, aerated containers (87 L) at 0600 (PDT) hrs on 15 June 2011 and 11 June 2012. All fish handling procedures utilized sanctuary aquarium nets, 3 mm-diameter nylon-knotless dip nets, darkened and covered containers, and water supplemented with Stress Coat™ (Mars Fishcare, Chalfont, PA) to reduce handling stress to test fish. No test fish mortalities occurred during the study period.

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

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

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

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 Springs and Camp Creek, both tributaries to the White River (Puyallup River tributary) as well as other upper tributaries in the 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 show an increasing trend, possibly associated with high odd year pink salmon returns in the White River beginning in 2005. A total of 264 bull trout (char) were 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 the White River, however, the risk of water quality impacts affecting the health of bull trout would be low 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.

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

Listed species affected: White River Winter Steelhead ESU/Population: Puyallup River Steelhead /Puget Sound DPS Activity: White River Steelhead Hatchery Program				
Location of hatchery activity: Buckley Trap, Diru & White River Hatcheries Dates of activity: November-Oct, 2006 –TBD **Hatchery program operator: PTI & MIT**				
	Annual Take of Listed Fish By Life Stage *(Number of Fish)*			
Type of Take	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)			Up to 47	
Intentional lethal take f)				
Unintentional lethal take g)				
Other Take (specify) h)				

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

Instructions:

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

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

Listed species affected: Chinook ESU/Population: White River /Puget Sound Activity: White R. Winter Steelhead hatchery program				
Location of hatchery activity: Buckley Trap, Diru & White River Hatcheries Dates of activity: 2006 –TBD Hatchery program operator: PTI & MIT				
	Annual Take of Listed Fish By Life Stage *(Number of Fish)*			
Type of Take	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)				
Other Take (specify) h)	Potential take discussed in section 2, unable to estimate	Potential take discussed in section 2., unable to estimate		

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.

Attachment 1. Definition of terms referenced in the HGMP template.

Augmentation - The use of artificial production to increase harvestable numbers of fish in areas where the natural freshwater production capacity is limited, but the capacity of other salmonid habitat areas will support increased production. Also referred to as "fishery enhancement".

Critical population threshold - An abundance level for an independent Pacific salmonid population below which: dispensatory processes are likely to reduce it below replacement; short-term effects of inbreeding depression or loss of rare alleles cannot be avoided; and productivity variation due to demographic stochasticity becomes a substantial source of risk.

Direct take - The intentional take of a listed species. Direct takes may be authorized under the ESA for the purpose of propagation to enhance the species or research.

Evolutionarily Significant Unit (ESU) - NMFS definition of a distinct population segment (the smallest biological unit that will be considered to be a species under the Endangered Species Act). A population will be/is considered to be an ESU if 1) it is substantially reproductively isolated from other conspecific population units, and 2) it represents an important component in the evolutionary legacy of the species.

Harvest project - Projects designed for the production of fish that are primarily intended to be caught in fisheries.

Hatchery fish - A fish that has spent some part of its life-cycle in an artificial environment and whose parents were spawned in an artificial environment.

Hatchery population - A population that depends on spawning, incubation, hatching or rearing in a hatchery or other artificial propagation facility.

Hazard - Hazards are undesirable events that a hatchery program is attempting to avoid.

Incidental take - The unintentional take of a listed species as a result of the conduct of an otherwise lawful activity.

Integrated harvest program - Project in which artificially propagated fish produced primarily for harvest are intended to spawn in the wild and are fully reproductively integrated with a particular natural population.

Integrated recovery program - An artificial propagation project primarily designed to aid in the recovery, conservation or reintroduction of particular natural population(s), and fish produced are intended to spawn in the wild or be genetically integrated with the targeted natural population(s). Sometimes referred to as "supplementation".

Isolated harvest program - Project in which artificially propagated fish produced primarily for harvest are not intended to spawn in the wild or be genetically integrated with any specific natural population.

Isolated recovery program - An artificial propagation project primarily designed to aid in the recovery, conservation or reintroduction of particular natural population(s), but the fish produced are not intended to spawn in the wild or be genetically integrated with any specific natural population.

Mitigation - The use of artificial propagation to produce fish to replace or compensate for loss of fish or fish production capacity resulting from the permanent blockage or alteration of habitat by human activities.

Natural fish - A fish that has spent essentially all of its life-cycle in the wild and whose parents spawned in the wild. Synonymous with *natural origin recruit (NOR).*

Natural origin recruit (NOR) - See *natural fish* .

Natural population - A population that is sustained by natural spawning and rearing in the natural habitat.

Population - A group of historically interbreeding salmonids of the same species of hatchery, natural, or unknown parentage that have developed a unique gene pool, that breed in approximately the same place and time, and whose progeny tend to return and breed in approximately the same place and time. They often, but not always, can be separated from another population by genotypic or demographic characteristics. This term is synonymous with stock.

Preservation (Conservation) - The use of artificial propagation to conserve genetic resources of a fish population at extremely low population abundance, and potential for extinction, using methods such as captive propagation and cryopreservation.

Research - The study of critical uncertainties regarding the application and effectiveness of artificial propagation for augmentation, mitigation, conservation, and restoration purposes, and identification of how to effectively use artificial propagation to address those purposes.

Restoration - The use of artificial propagation to hasten rebuilding or reintroduction of a fish population to harvestable levels in areas where there is low, or no natural production, but potential for increase or reintroduction exists because sufficient habitat for sustainable natural production exists or is being restored.

Stock - (see "Population").

Take - To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

Viable population threshold - An abundance level above which an independent Pacific salmonid population has a negligible risk of extinction due to threats from demographic variation (random or directional), local environmental variation, and genetic diversity changes (random or directional) over a 100-year time frame.

Attachment 2. Age class designations by fish size and species for salmonids released from hatchery facilities.

(generally from Washington Department of Fish and Wildlife, November, 1999).

	SPECIES/AGE CLASS	Number of fish/pound	SIZE CRITERIA Grams/fish
X	Chinook Yearling	<=20	>=23
X	Chinook (Zero) Fingerling	>20 to 150	3 to <23
X	Chinook Fry	>150 to 900	0.5 to <3
X	Chinook Unfed Fry	>900	<0.5
X	Coho Yearling 1/	<20	>=23
X	Coho Fingerling	>20 to 200	2.3 to <23
X	Coho Fry	>200 to 900	0.5 to <2.3
X	Coho Unfed Fry	>900	<0.5
X	Chum Fed Fry	<=1000	>=0.45
X	Chum Unfed Fry	>1000	<0.45
X	Sockeye Yearling 2/	<=20	>=23
X	Sockeye Fingerling	>20 to 800	0.6 to <23
X	Sockeye Fall Releases	<150	>2.9
X	Sockeye Fry	> 800 to 1500	0.3 to <0.6
X	Sockeye Unfed Fry	>1500	<0.3
X	Pink Fed Fry	<=1000	>=0.45
X	Pink Unfed Fry	>1000	<0.45
X	Steelhead Smolt	<=10	>=45
X	Steelhead Yearling	<=20	>=23
X	Steelhead Fingerling	>20 to 150	3 to <23
X	Steelhead Fry	>150	<3
X	Cutthroat Trout Yearling	<=20	>=23
X	Cutthroat Trout Fingerling	>20 to 150	3 to <23
X	Cutthroat Trout Fry	>150	<3
X	Trout Legals	<=10	>=45
X	Trout Fry	>10	<45

1/ Coho yearlings defined as meeting size criteria and 1 year old at release, and released prior to June 1st.
2/ Sockeye yearlings defined as meeting size criteria and 1 year old.