Klickitat Spring Chinook Production Program
Klickitat Hatchery Complex

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HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Final Draft

Hatchery Program	Klickitat Spring Chinook Production Program- Klickitat Hatchery
Species or Hatchery Stock	Chinook Salmon *(Oncorhynchus tshawytscha)*
Agency/Operator	Yakama Nation
Watershed and Region	Klickitat River, Columbia Gorge
Date Submitted	November 12, 2013
Date Last Updated	August 2013

Section 1: General Program Description

1.1 Name of hatchery or program.

Klickitat Spring Chinook Production Program- Klickitat Hatchery

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

Klickitat Spring Chinook Salmon *(Onchorynchus tshawtscha)*

ESA Status: Not listed and not a candidate for listing

1.3 Responsible organization and individuals.

Name (and title):	Jason Rau (Klickitat Hatchery Complex Manager)
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Other agencies, Tribes, co-operators, or organizations involved,

including contractors, and extent of involvement in the program.

Co-operators	Role
WDFW	Hatchery Specialist 1
USFWS	Fish Health Services

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

Funding Sources
Mitchell Act

Operational Information	Contract Number NA06NMF4360230
Full time equivalent staff	6.0
Estimated Annual operating cost (dollars)	$435,000

1.5 Location(s) of hatchery and associated facilities.

Broodstock source	Klickitat Hatchery/RKm 68/ Klickitat River
Broodstock collection location (stream, RKm, subbasin)	Lyle Falls Fishway/RKm 3.5/Klickitat River Klickitat Hatchery RKm 68, Castile Falls Rkm 102.
Adult holding location (stream, RKm, subbasin)	Klickitat Hatchery/RKm 68/ Klickitat River
Spawning location (stream, RKm, subbasin)	Klickitat Hatchery/RKm 68/ Klickitat River
Incubation location (facility name, stream, RKm, subbasin)	Klickitat Hatchery/RKm 68/ Klickitat River
Rearing location (facility name, stream, RKm, subbasin)	Klickitat Hatchery/RKm 68/ Klickitat River

1.6 Type of program.

Integrated Conservation/Harvest

The existing segregated harvest program will be converted to an integrated conservation/harvest program by incorporating an increasing proportion of NOR Klickitat River spring Chinook into the broodstock over a total of 4 phases. In addition, the current hatchery line will be terminated once a sufficient number of F1 hatchery adults (NOR x NOR crosses) are returning to support interim production goals. (HSRG, WDFW, and Northwest Indian Fisheries Committee 2004a). The pace of broodstock conversion will depend on the size of the spring Chinook run which is expected to vary over time. To reduce impacts to the wild spring Chinook population, no more than approximately 25% of the run's wild component will be taken for hatchery broodstock in any year. The program will be designed to increase the viability of the natural population while simultaneously producing the adults needed to meet harvest objective for all fisheries combined. To achieve both conservation and harvest objectives, it is estimated that the hatchery program will maintain a release number of approximately 800,000 yearling spring Chinook. For a thorough and complete review of the hatchery transition process, please refer to Appendix 3 at the end of this document.

A portion of the F1 hatchery adults derived from natural-origin broodstock (NOR x NOR crosses) returning to Lyle Falls or the hatchery will be transported and released above Castile Falls to seed the upper Basin. For the first 5 years of returns, the number of these adults transported and released above Castile Falls will not be restricted. As natural escapement levels increase overtime, hatchery releases of adults into the upper Basin will be reduced to meet the PNI standard of 0.67. A PNI value of 0.67 ensures that the natural, not the hatchery, environment drives local adaptation (HSRG, WDFW, and Northwest Indian Fisheries Committee 2004a). Achieving this objective will require

monitoring natural and hatchery spring Chinook adults migrating past Castile Falls to determine the proportion of the composite population each represents. The strategy of using adults for re-colonization has several uncertainties including, but not limited to; the ability to capture a sufficient number of adults at the combined facilities (Lyle adult trap and Klickitat hatchery), the natural reproductive success of adults after extended periods of artificial confinement (adult holding at the hatchery), and willingness of adults to spawn in upper Basin without significant movement and relocation to downstream areas.

As noted above, a total of 4 phases have been identified to fully transition the current hatchery program to the proposed long term program. While an implementation schedule is provided in Appendix 3 (Tables 3 through 5), the actual timeline for transitioning from one phase to the next will rely on performance standards for one or more metrics such as adult return rates for hatchery origin Chinook, and abundance trends for the natural population. Thus, the timeline provided represents the quickest possible transition period assuming all performance standards are being met. A brief description of each phase and hatchery line is described below:

Phase I- Implement collection of NOR adults for new hatchery stock (N_1 line)

Approximately 68 NOR adults will be collected during this phase of the program thus, producing a smolt release of ~100,000 yearling smolts. NOR adults will be spawned with NOR adults and differentially marked from the existing hatchery line (H_1 line) to allow unique identification and improved survival through mark-selective fisheries (no adipose clip will be applied).

Phase II- Implement harvest augmentation hatchery stock conversion (H_2 line)

Phase II will begin propagation of the new H_2 hatchery line while simultaneously terminating brood collection for the H_1 hatchery line. The founder stock to be used for the new H_2 hatchery line will consist of returning adults from the N_1 hatchery line. Collection of N_1 adults for the H_2 line will be triggered by the first year when sufficient numbers of adults return with all age classes present from the N_1line. Phase II will terminate the H_1line when N_1 returns are sufficient to maintain a release number equivalent to 300,000-350,000 smolts.

Phase III- Complete hatchery stock conversion, begin increasing total hatchery release numbers toward project's final release numbers.

The beginning of phase III should mark a point in time when H_1line adults are no longer returning to the basin, and increases in natural production should be readily observed. This phase of the program will begin increasing the number of hatchery releases toward the Master Plan's stated release goals. Information to be analyzed in the decision framework to initiate phase III will include a stock status review of the natural population, and performance (adult return rates) of N_1 and H_2 hatchery lines.

Phase IV- Final increase of N_1 hatchery line and/or H_2 hatchery line release numbers to meet stated project objectives.

The final phase of the program will increase hatchery releases to the full extent as outlined in the Master Plan. Similar to phase III, information to be analyzed in the decision framework to initiate phase IV will include a stock status review of the natural population, and performance (adult return rates) of N_1 and H_2 hatchery lines.

Fish will be incubated, reared, and released volitionally at the Klickitat River Hatchery. The fish will be released volitionally from the hatchery starting in April at a size of 12 to15 fpp. All juveniles produced from the existing HOR broodstock will be adipose-clipped so that they may be targeted in selective fisheries. Approximately 17% of all groups will be tagged with a CWT to determine overall survival and harvest rates in ocean, mainstem Columbia River, and Subbasin fisheries. In the final transition period and years beyond, broodstock will be managed to achieve a PNI of 0.67 over time. This objective will be achieved by controlling the number of hatchery fish spawning naturally and NOR adults used as broodstock.

Broodstock may be collected at Lyle Falls, Klickitat River Hatchery, and Castile Falls.

1.7 Purpose (Goal) of program.

- To provide harvest to tribal, sport fisheries, and commercial fisheries while preserving and protecting the indigenous spring Chinook population.
- To provide fish production to sustain tribal Zone 6 fisheries, sport and tribal fisheries at the mouth of the Klickitat River, in-river sport fisheries, and mixed stock ocean fisheries. (Harvest Goals in Master plan are 1,000 for combined mainstem fisheries (Zones 1-6: treaty (600), sport & commercial (400)) and 3,000 for combined terminal fisheries (1,800 treaty, 1,200 sport).
- Produce spring Chinook salmon to help mitigate for fish losses resulting from development activities within the Columbia River Basin that have decreased salmonid populations

1.8 Justification for the program.

- The spring Chinook production program is funded through the Mitchell Act via NMFS to provide for the conservation of fisheries resources in the Columbia River Basin. The “Mitchell Act” (Act) (Public Law 75-502) was passed in 1938.
- Federal Court Decisions (US vs. Oregon and US vs. Washington) ruled that Indian Tribes who signed treaties with the federal government in the 1850s have treaty rights to harvest a share (50%) of surplus fish resources.
- Yakima/Klickitat Fisheries Project (YKFP or Project)
- Pacific Northwest Electric Power Planning and Conservation Act.
- Columbia River Fisheries Development Program
- 2008-2017 *US. v. Oregon* Management Agreement

In order to minimize impact on listed fish by YN facilities operation and the Klickitat spring Chinook program, the following Risk Aversion measures are

included in this HGMP:

Summary of risk aversion measures for the Klickitat Spring Chinook program

Potential Hazard	Risk Aversion Measures
Water Withdrawal	Water rights are formalized through trust water rights from the Department of Ecology. Monitoring and measurement of water usage is reported in monthly NPDES reports. Water withdrawals are not of an amount that has significant impact on the aquatic resources of the river. Water permits for the Klickitat Hatchery are listed as: S4-01258CWRIS, S428163CWRIS, S4-27553CWRIS, S4-27554CWRIS, S4*07272CWRIS,S3-+22202CWRIS,S4-*07273PWRIS, S4-*07274PWRIS, S4-30084. Lyle Falls Fishway S4-35252.
Effluent Discharge	Klickitat Hatchery operates under the "*Federal Aquaculture Facilities and Aquaculture Facilities Located in Indian Country within the Boundaries of the State of Washington*" National Pollution Discharge Elimination System (NPDES) general permit (WAG-130021)" National Pollution Discharge Elimination System (NPDES) established and administered by the US EPA.
Broodstock Collection & Adult Passage	Broodstock will be collected at the new Lyle Falls Fishway, Castile Falls Fishway, and The Klickitat Hatchery. All facilities have been designed with significant input from NMFS engineers to meet NMFS passage and fish handling criteria.
Disease Transmission	*Fish Health Policy in the Columbia Basin, d*etails hatchery practices and operations used to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).
Competition & Predation	Fish will be released volitionally from rearing ponds. Fish will be released at sizes similar to naturally produced spring Chinook juveniles.

1.9 List of program "Performance Standards".

See section 1.10

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

1.10.1 Benefits:

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Assure that hatchery operations support Columbia River fish Mgt. Plan *(US v Oregon)*, production and harvest objectives.	Contribute to a meaningful harvest for sport, tribal and commercial fisheries (Harvest Goals in Master plan are 1,000 for combined mainstem fisheries (Zones 1-6: treaty (600), sport & commercial (400)) and 3,000 for combined terminal fisheries (1,800 treaty, 1,200 sport).	Survival and contribution to fisheries will be estimated for each brood year released. Work with co-managers to manage adult fish returning in excess of broodstock need.
Productivity	Observed average spawner recruit value of ~9.0 for hatchery spring Chinook	Productivity will be determined by counting tagged fish recovered at traps, broodstock collection facilities, sport and tribal fisheries and on the spawning grounds.
Straying of Klickitat River origin fish to other subbasins	Stray rate of less than 5%	Regional M&E efforts will be used to track the number and capture location of Klickitat River origin fish
Assure that the proportion of natural influence (PNI) achieves HSRG Targets	PNI Goal of 0.67	All spring Chinook released from the hatchery will be marked with either an elastomer or an adipose fin clip. This action will allow managers to determine broodstock composition, hatchery fish contribution to the natural spawning escapement, and natural fish contribution to hatchery broodstock.
Maintain outreach to enhance public understanding, participation and support of Yakama Nation YKFP salmon restoration programs.	Provide information about YN programs to internal and external audiences. For example, local schools and special interest groups tour the facility to better understand hatchery operations. Off station efforts may include festivals, classroom participation, stream adoptions and fairs.	Evaluate use and/or exposure of program materials and exhibits as they help support goals of the information and education program. Record on-station organized education and outreach events.
Program contributes to fulfilling tribal trust responsibility mandates and treaty rights	Follow pertinent laws, agreements, policies and executive and judicial orders on consultation and coordination with Native American tribal governments	Participate in annual coordination meetings between the co-managers to identify and report on issues of interest, coordinate management, and review programs.
Implement measures for broodstock management to maintain integrity and genetic diversity. Maintain effective population size. Maximize available Natural Origin Broodstock (NOB).	Approximately 308-549 adults are collected throughout the spawning run in proportion to timing, age and sex composition of return. Of these approximately 68-138 will be natural origin adults for the conservation program broodstock and no more than approximately 25% of the natural origin run will be used .	Annual run timing, age and sex composition and return timing data are collected. Spawning surveys and fish counts at the new Lyle Falls fish facility will be used to ensure that natural escapement goals are met each year. Out-of-basin origin fish stocks will not be released into the Klickitat River.
Region-wide, groups are marked in a manner consistent with information needs and protocols to estimate impacts to natural and hatchery origin fish	200,000 NOR Elastomer Tags to track conversion to local broodstock. 30,000 of these will receive a CWT 600,000 AD-clip HOR 102,000 of these will receive a CWT.	Returning fish are sampled throughout their return for length, sex, and marks. Scale samples will be collected to determine HOR and NOR adults used for hatchery broodstock; this data will be used to determine if unmarked fish are the result of poor tagging techniques or lost tags.

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens. Follow Co-managers Fish Health Disease Policy (WDFW and NWIFC 1998).	Necropsies of fish to assess health, nutritional status, and culture conditions	USFWS Fish Lower River Fish Health Center pathologist inspects adult broodstock yearly and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, the USFWS pathologist recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as deemed necessary A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.
	Release and/or transfer exams for pathogens.	1 to 6 weeks prior to transfer or release, fish are examined in accordance with the Co-managers Fish Health Policy.
	Inspection of adult broodstock for parasites and pathogens.	At spawning, lots of 60 adult broodstock are examined for pathogens.
	Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens.	Controls of specific fish pathogens through eggs/fish movements are conducted in accordance to Co-managers Fish Health Disease Policy (WDFW and NWIFC 1998).

1.10.2 Risks:

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Minimize impacts and/or interactions to ESA listed fish.	Hatchery operations will comply with all state and federal regulations (See below). Smolts will be released at a size (12-15 fpp) and condition that ensures they migrate rapidly from the system after release.	Monitor and report size, number, date of release and mass mark quality. ATPase data will be collected on juveniles prior to release to document smoltification levels. NOR/HOR ratio on the spawning grounds and broodstock will be monitored.
Disease: Artificial production facilities are operated in compliance with all applicable fish health guidelines, facility operation standards and protocols including IHOT, Co-managers Fish Health Policy and drug usage mandates from the Federal Food and Drug Administration	Hatchery goal is to prevent the introduction, amplification or spread of fish pathogens that might negatively affect the health of both hatchery and naturally reproducing stocks and to produce healthy smolts that will contribute to the goals of this facility.	Pathologists from USFWS Lower River Fish Health Center monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed.
Water Quality: Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring	NPDES permit compliance YN water right-permit compliance.	Flow and discharge reported in monthly NPDES reports.
Entrainment/ Blockage: Water withdrawals and instream 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.

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Hatchery operations comply with ESA responsibilities.	YN completes an HGMP and is issued a federal and state permit when applicable.	Identified in HGMP and Biological Opinion for hatchery operations.
Harvest of hatchery-produced fish minimizes impact to wild populations.	Harvest is regulated to meet appropriate biological assessment criteria. Mass mark juvenile hatchery fish prior to release to enable state agencies to implement selective fisheries.	Harvests are monitored by agencies and tribes to provide up to date information..

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

Approximately 308-549 adults at 1:1 female to male ratio.

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

Age Class	Max. No.	Size (fpp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Water-shed	Eco-province
Yearling (NOR Broodstock)							
Yearling (HOR)	800,000	12 -15	April	Klickitat	RKm 68	Klickitat	Columbia Gorge

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

Brood Year	Smolt to Adult Survival (%)
1990	0.08
1991	0.19
1992	0.29
1993	0.09
1994	0.01
1995	0.14
1996	0.54
1997	0.10
1998	0.62
1999	1.31
2000	0.32
2001	0.32
2002	.09
2003	.04
2004	.02
2005	.05
2006	.13

Return	Returns			Escapement		
Year	Total	Hatchery	Wild	Total	Hatchery	Wild
1990	2583	1858	725	798	574	224
1991	1477	1018	459	775	534	241
1992	1540	1026	514	953	635	318
1993	3702	2985	717	2219	1789	430
1994	958	831	127	725	629	96
1995	696	606	90	556	484	72
1996	1156	782	374	848	574	274
1997	1861	1083	778	1424	829	595
1998	702	397	305	553	313	240
1999	728	578	150	577	458	119
2000	2708	1601	1107	1262	746	516
2001	1126	595	531	662	350	312
2002	2549	1250	1299	1762	864	898
2003	3966	1931	2035	2226	1084	1142
2004	2994	1685	1309	1868	1051	817
2005	1428	1140	288	619	494	125
2006	1603	1182	420	922	621	301
2007	1078	647	430	741	416	325
2008	1115	707	409	522	287	236
2009	1595	1356	239	1094	855	239
2010	1727	1327	400	1143	771	372
2011	1701	1071	629	1140	515	624
2012	2100	1344	755	1150	433	716
Avg	1889	1358	531	1128	792	336

Klickitat Spring Chinook adult (age-4, -5, -6) returns and escapement from YN and WDFW databases

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

The first year of operation for this hatchery was 1951.

1.14 Expected duration of program.

The program is on-going with no planned termination.

1.15 Watersheds targeted by program.

Klickitat Subbasin/Columbia Gorge Province

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

1.16.1 Potential Alternatives to the Proposed Program:

Alternative 1 – Status Quo: Maintain current segregated hatchery program. This program did not protect the natural spring Chinook stock in the Subbasin and also did not meet tribal and sport harvest objectives and was therefore rejected.

Alternative 2- Using 100% NOR as broodstock. Habitat quantity and quality in the Klickitat River was insufficient to meet natural production escapement goals (700) and provide broodstock (308-549) needed for the hatchery program.

A more detailed description of these alternatives can be found in the Klickitat River Anadromous Fisheries Master Plan (Yakama Nation 2012, in draft).

1.16.3 Potential Reforms and Investments:

Reform/Investment
1: Completion of Lyle Falls Adult Trap in lower river to increase monitoring capabilities, and broodstock collection.

2: Completion of the Castile Falls Monitoring Facility to monitor natural production escapement into the upper Klickitat Subbasin, and function as an additional brood collection location.

3: Conceptual Design Study (30%) for Klickitat Hatchery Improvements

4: Design & Build (cost share w/ BPA) Pond #25 conversion to sediment basin and spring Chinook river-water acclimation site development.

Section 2: Program Effects on ESA-Listed Salmonid Populations

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

Program is described in the Biological Assessment For The Operation Of Hatcheries Funded by The National Marine Fisheries Service (March 1999), Statewide Section 6 consultation with USFWS for interactions with Bull Trout, and concurrent with this HGMP to satisfy Section 7 consultations. The YN is writing HGMPs to cover all hatchery programs in the Klickitat River.

This document is intended to be consistent with NOAA (2008) which states (RPA 39):

The FCRPS Action Agencies will continue funding hatcheries in accordance with existing programs… Consultation under the ESA on the operation of hatchery programs funded by the FCRPS Action Agencies [will] include the submittal of updated and complete HGMPs. Updated and complete HGMPs are to be submitted to NOAA Fisheries and ESA consultation should be initiated by … July 2009 for hatchery programs in the Middle Columbia … ESA consultations should be completed by January 2010 for hatchery programs in the Middle Columbia …

Project sponsors are also aware of direction in NOAA (2009) calling "for consultations on hatchery programs within the MCR Steelhead DPS to be completed by January 2010". Project sponsors remind NOAA of its statement in this document that "mitigation obligations will not be diminished under this process". The Yakama Nation considers this project essential to meeting federal commitments to honor the Treaty of 1855, and to "protect, rebuild, and enhance" anadromous salmon populations throughout tribal usual and accustomed fishing areas as described in the 2008-2017 United States v Oregon Management Agreement and in the Columbia River Fish Accords. As such, any changes to program parameters which would diminish the number of adult salmon returning to tribal usual and accustomed fishing areas that result from this HGMP development and consultation process will not be implemented unless and until they are considered and approved in appropriate policy fora.

NOAA. 2008. Consultation Title: Remand of 2004 Biological Opinion on the Federal Columbia River Power System (FCRPS) including 19 Bureau of Reclamation Projects in the Columbia Basin (Revised pursuant to court order, NWF v. NMFS, Civ. No. CV 01-640-RE (D. Oregon). Tracking Number: 2005/05883. https://pcts.nmfs.noaa.gov/pls/pcts-pub/pcts_upload.summary_list_biop?p_id=27149

NOAA. 2009. Letter from Rob Jones, Chief, Salmon Recovery Division, National Marine Fisheries Service, Portland Oregon to "Interested Parties", dated March 5, 2009. NMFS, Portland Office, 1201 NE Lloyd Blvd, Suite 100, Portland, Oregon.

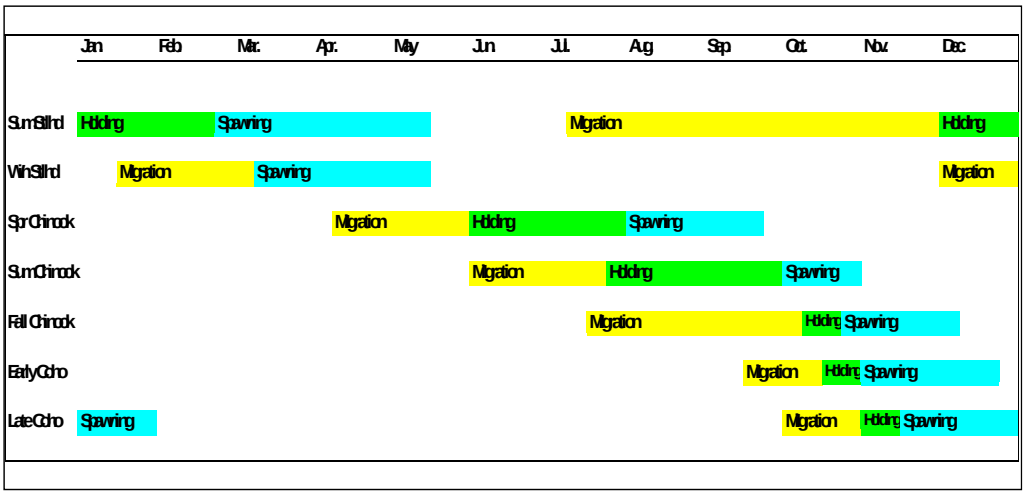
2.2 Descriptions, status and projected take actions and levels for ESA-listed natural populations in the target area.

ESA listed stock	Status	Take Level	Action
Summer Steelhead-Natural	Threatened	Minor	Broodstock collection/trapping at Lyle Falls, juvenile trapping, stream fish sampling
Winter Steelhead-Natural	Threatened	Minor	Broodstock collection/trapping at Lyle Falls, juvenile trapping, stream fish sampling
Bull Trout – Natural	Threatened	Minor	Broodstock collection/trapping at Lyle Falls, juvenile trapping, stream fish sampling

Spring Chinook adults used as broodstock will be collected at Lyle Falls. Trapping for broodstock collection and monitoring activities could result in the capture and/or injury of native steelhead and bull trout. See Section 2.2.3 and Appendix 1 for descriptions of activities and estimated take.

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

Adult and juvenile run-timing for listed steelhead and other fish species are presented in the figure below.



The majority of the steelhead population is found from the mouth of the Klickitat River to Castile Falls. Until improvements in 2005, steelhead access to areas above Castile falls had been limited due to poor migration conditions at the Castile Falls fishway tunnels. Steelhead spawning is concentrated between RKm 8 and 80. Tributary spawning occurs in White Creek watershed (including Brush and Tepee Creeks), Summit Creek, Dead Canyon Creek, the lower Little Klickitat watershed (including Bowman and Canyon Creeks), Swale Creek, Snyder Creek, and occasional use of tributaries below the town of Klickitat.

Klickitat River bull trout life history characteristics are not very well understood, but bull trout are present in the middle and lower mainstem Klickitat and are concentrated in the West Fork Klickitat watershed and several of its tributaries. The population in the West Fork Klickitat watershed is likely resident and while the fish found in the mainstem Klickitat are likely adfluvial or migratory. Falls on the West Fork likely isolate most of the resident bull trout population from the mainstem Klickitat River.

Maps depicting steelhead and bull trout distribution in the Klickitat River are presented in Appendix 2.

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

No NMFS ESA-listed populations will be directly affected by this program.

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

Middle Columbia River Steelhead January 5, 2006 (71 FR 834); Threatened.
Columbia Basin DPS Bull Trout June 10, 1998 (63 FR 31647), Threatened**.**

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

Middle Columbia River Steelhead *(Oncorhynchus mykiss*) January 5, 2006; (71 FR 834),, Threatened.

The ICTRT has identified Klickitat River steelhead as an independent population belonging to the Mid-Columbia ESU. The Middle Columbia steelhead ESU was listed as threatened under the ESA on March 25, 1999 (64 FR 14517) an reaffirmed January 5, 2006; (71 FR 834). The Klickitat steelhead population includes both summer-run and winter-run steelhead (Yakama Nation 2012).

Temporal and spatial spawning segregation between the Klickitat steelhead summer and winter runs has not yet been clearly defined. Ongoing genetic analysis and radio telemetry monitoring is expected to provide additional information about the spatial and temporal distribution of both steelhead races.

Past genetic analysis on steelhead have shown some degree of genetic differentiation between tributaries to the Klickitat River; genetic samples from the upper Klickitat, White Creek, and Trout Creek seem to diverge most widely from the Skamania Hatchery stock (Marshall 2000). Recent genetic analysis indicates there may be six to seven genetically distinct populations of naturally reproducing steelhead in this river system. The results also suggest the genetic integrity and variation of native Klickitat River steelhead have been maintained despite repeated hatchery introduction and that the potential is high for restoring the population's viability (Narum et al. 2006).

No solid historical data exist on the size and productivity of the Klickitat summer steelhead run. Based on NOAA Fisheries historical intrinsic potential analysis, the ICTRT considers the Klickitat River population to be an "intermediate" sized population that can support a minimum of 1,000 spawners (ICTRT 2007).

The escapement of naturally spawning (summer and winter, hatchery and wild combined) steelhead in the Klickitat River from 1987 to present has been estimated at approximately 700 fish (see below). However, this estimate is based on redd count data which is believed to be an underestimate because of

difficulties associated with conducting accurate counts during spring flow conditions (NPCC 2004). YN biologists hypothesize that the actual mean escapement is closer to 900-1000 spawners annually.

Recent mark-recapture evaluations using hatchery and natural origin summer steelhead trapped and tagged at Lyle Falls estimates natural origin returns to the lower Klickitat River to average about 1600 fish from 2005-2011 (Gray 2007 and Zendt et al. 2013).

Additionally, from the early 1960s to 2005, Castile Falls likely blocked all steelhead from stream habitat located upstream of the falls. By 2005, upstream fish passage conditions at Castile Falls were improved to allow steelhead access to this portion of the Subbasin. Habitat modeling work indicates that adult steelhead production potential above the falls may be as high as 750 adults (Yakama Nation 2012). If the production potential estimate is accurate, total steelhead production in the Klickitat River Subbasin could increase to over 2,000 fish in the near future.

Based on population parameters developed for the area mainly below Castile Falls, the ICTRT rated Klickitat steelhead as having only a moderate risk in regards to the key population parameters of abundance/productivity and spatial structure/diversity. Thus, the population does not meet ICTRT criteria for a viable population, although it does meet criteria for a "Maintained" population (ICTRT 2007).

Columbia Basin DPS Bull Trout *(Salvelinus confluentus*) June 10, 1998 (63 FR 31647), Threatened.

The Fish and Wildlife Service issued a final rule listing the Columbia River and Klamath River populations of bull trout *(Salvelinus confluentus*) as a threatened species under the Endangered Species Act on June 10, 1998 (63 FR 31647). The Columbia River Distinct Population Segment is threatened by habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, and past fisheries management practices such as the introduction of non-native species.

The Lower Columbia Recovery Unit Team identified two core areas (Lewis and Klickitat rivers) within the recovery unit. The Klickitat Core Area includes all tributaries downstream to the confluence with the Columbia River. Recent evidence indicates both resident and adfluvial bull trout are present in the Subbasin. Numerous confirmed and anecdotal reports of bull trout exist in the mainstem Klickitat River from the mouth up to the area below Castile Falls. Sizes reported are indicative of an adfluvial life history. Presence of resident populations has also been documented in the West Fork Klickitat River, Fish Lake Stream, Little Muddy Creek, Trappers Creek, Clearwater Creek, Two Lakes Stream, and an unnamed tributary to Fish Lake Stream (all within the West Fork Klickitat watershed) (Byrne et al. 2001, Thiesfeld et al. 2002, Gray 2007).

The abundance of the stock in the Klickitat River is poorly known. There are insufficient data to make an assessment. However, it appears that there are

very few bull trout in the lower- to mid-Klickitat drainage. Bull trout appear to be more abundant in the upper drainage where habitat conditions are more favorable.

Preliminary results of recent genetic analysis indicate that resident bull trout in the Klickitat Subbasin are genetically distinct from other Columbia tributary populations, but that fish in two West Fork Klickitat tributaries (Trappers and Clearwater creeks) do not differ significantly from each other.

The impacts of hatchery salmon and steelhead in the main Klickitat River on bull trout are not known. Generally, in drainages colonized by anadromous salmon and steelhead, char successfully co-exist by occupying a different ecological niche. However, negative interactions (predation) may occur when hatchery fish are released near char spawning and rearing areas.

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

Describe hatchery activities: The following activities listed below are identified as general hatchery actions that are identified in the ESA Section 7 Consultation "Biological Opinion on Artificial Propagation in the Columbia River Basin" (March 29, 1999) (NMFS 1999).

Broodstock Program

Broodstock Collection: Broodstock will be collected for this program mainly at Lyle Falls from (April -July, Castile Falls (May-August) and, at the Klickitat Hatchery (April-August). No listed fish have been observed during broodstock collection activities at the Klickitat Hatchery (J. Rau, YKFP pers. comm. 2013). The operation of the new adult collection facilities at Lyle Falls and Castile Falls will likely result in some ESA-listed steelhead being handled as the facilities will be operated during times of the year when steelhead may be migrating to spawning grounds. These two facilities have been constructed to meet NMFS passage and handling criteria which should minimize stress and associated mortality rates on handled fish.

Rearing Program

Operation of Hatchery Facilities: Indirect take for listed species is unknown from operation of the hatchery facility. Activities that may impact listed fish species include:

Water diversion: Water is diverted from the stream for hatchery operations. This results in a decrease in the amount and quality of 1,275 linear feet of stream habitat from the Pond 25 (east bank) river intake to the pond discharge flume. The loss in habitat may result in a decrease in steelhead and bull trout abundance; although this has not been quantified, it is expected to be negligible.

Water Quality: This facility operates under the "*Federal Aquaculture Facilities and Aquaculture Facilities Located in Indian Country within the Boundaries of the State of Washington*" National Pollution Discharge Elimination System (NPDES) general permit (WAG-130021) which conducts effluent monitoring and reporting and operates within the limitations established in its permit administered by the Environmental Protection Agency (EPA). Monthly and annual reports on water quality sampling, use of chemicals at this facility, compliance records are available from EPA. Discharges from the cleaning treatment system are monitored as follows:

Total Suspended Solids (TSS): Collected 1 to 2 times per month on composite effluent, maximum effluent and influent samples.

Settleable Solids (SS) Collected 1 to 2 times per week on effluent and influent samples.

In-hatchery Water Temperature - Daily maximum and minimum readings.

Water quality monitoring is not expected to result in the take of listed species.

Disease: Outbreaks in the hatchery may cause significant adult, egg, or juvenile mortality. Over the years, rearing densities, disease prevention and fish health monitoring have greatly improved the health of the programs at Klickitat Hatchery. Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995) Chapter 5 have been instrumental in reducing disease outbreaks. Fish are planted and transferred after a fish health specialist has determined the population health.

Indirect take from disease is unknown.

Release Program

Competition and Predation: According to the HSRG (2004) and Flagg et al. (2000), the potential for predation of wild salmonids by hatchery-reared smolts will depend on the size, number, and spatial distribution of both predators and prey, the functional and numerical responses of the predators, and the amount of time that predators and prey are in proximity. Busack et al. (2005) reviewed published rates of predation by juvenile hatchery salmonids on wild juvenile Chinook and found predation rates were generally low (<2% of natural population consumed). In contrast, data collected on hatchery coho predation rates on wild fall Chinook juveniles in the Lewis River were quite high (>11%) (Hawkins and Tipping 1999). The variability in study results is one reason the HSRG (2004) suggests that hatcheries monitor predation impacts resulting from hatchery releases.

In general, hatchery fish can consume fish that are 50% of their body size,

however studies reviewed by Busack et al. (2005) indicated that the range may extend from approximately 38% (steelhead) to 75% (coho). NOAA Fisheries and the USFWS in a number of biological assessments and opinions (e.g. USFWS 1994; NMFS 1999) were of the opinion that juvenile salmonids can consume prey less than ~33% of their body length. Predation by hatchery fish on wild fish can occur anywhere the two stocks exist in space and time. Therefore, predation may not only be a concern in the stream environment, but also in the estuary and marine environment.

The site-specific nature of predation and the limited number of empirical studies that have been conducted, make it difficult to predict the predation effects of this specific hatchery release. The YN is unaware of any studies that have empirically estimated the predation risks to listed fish posed by the Klickitat Hatchery programs. In the absence of site-specific empirical information, the identification of risk factors can be a useful tool for reviewing hatchery programs while monitoring and research programs are developed and implemented.

Risk Factors:

Date of Release: The release date can influence the likelihood that listed species are encountered. Spring Chinook will be released in March and April, which is before listed steelhead fry emerge from the gravel. Therefore, spring Chinook predation on listed steelhead fry is unlikely.

Fish Size at Release: Based on the 33% of body length predation assumption put forward by NMFS and USFWS, and a spring Chinook size of release range of 139-155 mm, hatchery Chinook may consume listed steelhead that range in size from 46-51 mm and smaller. During the time of release (March-April) the majority of steelhead juveniles present in the system are expected to be 1+ smolts that are generally larger than 80 mm. These fish are too large to be consumed by spring Chinook hatchery fish. However this assumption regarding predation and size has not been confirmed.

Release Location and Release Type: The likelihood of predation may also be affected by the location and the type of release. Other factors being equal, the risk of predation may increase with the length of time that fish co-mingle. In the freshwater environment, this is likely to be affected by distribution of the listed species in the watershed, the location of the release and the speed at which fish released from the program migrate. Spring Chinook will be released volitionally from rearing sites located at RKm 68. Based on data collected in the Cowlitz River (Harza 1998), salmon smolts are likely to migrate more than 25 kilometers per day. At this migration rate, spring Chinook should take from 1 to 7 days to migrate out of the basin. The small amount of time the hatchery fish are present in the Klickitat River should reduce possible competition and predation effects to listed fish species.

Residualism: To maximize smolting characteristics and minimize residualism, the YN adheres to a combination of acclimation, volitional

release strategies, size, and time guidelines as developed at the Cle Elum Supplementation and Research Facility (CESRF) for spring Chinook. For the spring Chinook yearling program the following actions are taken to reduce residualism:

Feeding rates and regimes throughout the rearing cycle are to be programmed to satiation feeding to minimize size variations and reprogrammed as needed to achieve goals for smolt size at time of release.

Fish Condition factors, standard deviation and co-efficient of variation (CV) on lengths of fish will be collected throughout the rearing cycle. The data are used to confirm that fish growth rates achieve size at release targets.

Releases from the hatchery and acclimation sites are set to mimic wild fish emigration timing.

Releases from acclimation ponds will be volitional so that fish not ready to migrate are not released from the ponds. This action should reduce competition effects to wild populations. ATPase data will be collected to confirm the onset and pace of smoltification.

Migration Corridor/Ocean*:* The Columbia River hatchery production ceiling, called for in the Proposed Recovery Plan for Snake River Salmon of approximately 197.4 million fish (1994 release levels), has been incorporated by NOAA-Fisheries into their 1999 hatchery biological opinions to address potential mainstem corridor and ocean effects, as well as other potential ecological effects from hatchery fish. For the period from 2005 to 2010, total hatchery releases within the Columbia River Basin are less than 145 million annually. Although hatchery releases occur throughout the year, approximately 80% occur from April to June and Columbia River mainstem out-migration occurs primarily from April through August (www.fpc.org). It is unknown to what extent listed fish are available both behaviorally and spatially on the migration corridor. Witty et al. (1995) concluded that, once in the main stem Columbia River, predation by hatchery production on wild salmonids does not significantly impact naturally produced fish survival in the Columbia River migration corridor. In a study designed to define the migrational characteristics of Chinook salmon, coho salmon, and steelhead trout in the Columbia River estuary, Dawley et al (1984) found the average migration rates for subyearling Chinook, yearling Chinook, coho, and steelhead, were 22, 18, 17, and 35 RKm/d respectively. There appear to be no studies demonstrating that large numbers of Columbia system smolts migrating to the ocean affect the survival rates of juveniles in the ocean. The lack of studies is due in part to the dynamics of fish rearing conditions in the ocean and an inability to measure ocean survival rates.

Monitoring:

Monitoring and evaluation activities have the potential to harass, kill or injured handled fish; these activities are summarized below and described in more detail in Appendix 1.

Monitoring and evaluation activities include: spawning ground surveys; adult salmonid monitoring at Lyle Falls and Castile Falls fishways; juvenile outmigration monitoring (using floating rotary screw traps); juvenile and resident salmonid population surveys (via stream electrofishing); scale analysis; sediment monitoring; temperature and water quality monitoring; habitat surveys; and genetic data collection and analysis.

Research:

No research program is associated with the spring Chinook hatchery program, other than the monitoring and evaluation activities described above and in Appendix 1.

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).

Data on the take of listed species is presented in the following table. These numbers include both natural- and hatchery-origin steelhead found in the Klickitat River subbasin. Hatchery-origin steelhead released in and returning to the Klickitat River are primarily from Skamania Hatchery. A breakdown of estimated take associated with each M&E activity is presented in Appendix 1.

Estimated listed salmonid take levels by hatchery activity.

Steelhead

ESU/Population	Middle Columbia River Steelhead
Activity	Klickitat Hatchery Spring Chinook Program
Location of hatchery activity	Klickitat R. Hatchery
Dates of activity	May – September
Hatchery Program Operator	YN & WDFW under co-managed YKFP

Type of Take	Annual Take of Listed Fish by life Stage (number of fish)

	Egg/Fry	Juvenile /Smolt	Adult	Carcass
Observe or harass (a)		50-150	100	
Collect for transport (b)				
Capture, handle, and release (c)		500-2000 wild; 2000-3000 hatchery*	650-950 wild; 800-1000 hatchery**	
Capture, handle, tag/mark/tissue sample, and release (d)		3000-10,000 wild***		
Removal (e.g., broodstock) (e)				
Intentional lethal take (f)				
Unintentional lethal take (g)		190 wild; 150 hatchery	25 wild; 30 hatchery	
Other take (indirect, unintentional) (h)				

* Smolt trapping operations for monitoring purposes
** Although steelhead have not been taken during past hatchery practices, it is anticipated that adult steelhead will be collected and handled at the new collection facilities at Lyle Falls. Mortality occurs only on rare occasions during these operations.
***Stream fish (juvenile steelhead and resident trout) sampling operations

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.

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.

Any mortality or handling of listed steelhead that exceeds the values shown above will be communicated to Fish Program staff for additional guidance. The YN Senior Fisheries Biologist, along with the Hatchery Complex Manager, will determine an appropriate plan of action through consultation with NOAA-Fisheries. With the exception of unusual events that could not be foreseen, take limits will not be exceeded without prior approval from NOAA-Fisheries.

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

No ESA-listed fish of any species have been collected (volitional swim-ins) nor observed during spring Chinook broodstock collection activities at the Klickitat Hatchery. Past take associated with monitoring activities has been similar to the above table.

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.

For ESU-wide hatchery plans, the release of hatchery spring Chinook into the Klickitat River is consistent with:

- 1999 Biological Opinion on Artificial Propagation in the Columbia River Basin (NMFS 1999)
- Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995)
- The 2008-2017 *U.S. v. Oregon* Management Agreement
- Columbia River Basin Fish and Wildlife Program (http://www.nwcouncil.org/library/2000/2000-19/Default.htm)
- Principles and Recommendations of the HSRG (HSRG 2004)
- Yakima/Klickitat Fisheries Project (YKFP or Project)
- Klickitat River Master Plan (2012)
- Klickitat Subbasin Recovery Plan for Middle Columbia River Steelhead ESU. (NOAA-Portland 2009)
- Program is consistent with Hatchery Scientific Research Group (HSRG) recommendations
- Columbia River Fish Accords

For statewide hatchery plan and policies, hatchery programs in the Columbia system adhere to a number of guidelines, policies and permit requirements in order to operate. These constraints are designed to limit adverse effects on cultured fish, wild fish and the environment that might result from hatchery practices. Following is a list of guidelines, policies and permit requirements that govern Columbia hatchery operations for the production of spring Chinook for the Klickitat River:

Genetic Manual and Guidelines for Pacific Salmon Hatcheries in Washington. These guidelines define practices that promote maintenance of genetic variability in propagated salmon.. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).

Hatchery Reform: Principles and Recommendations of the Hatchery Scientific Review Group (HSRG): Provides guidance on hatchery operations and their impacts to native salmon populations. The program is using HSRG recommendations for broodstock management.

Stock Transfer Guidelines: This document provides guidance in determining allowable stocks for release for each hatchery. It is designed to foster development of locally adapted broodstock and to minimize changes in stock

characteristics brought on by transfer of non-local salmonids (WDF 1991). *Spawning Guidelines*: provides guidance on the mating and spawning protocols followed at WDFW hatcheries (Seidel 1983).

Fish Health Policy in the Columbia Basin: Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Fish Policy Chapter 5, IHOT 1995).

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

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

The program described in this HGMP is consistent with the following agreements and plans:

- The Columbia River Fish Management Plan
- Klickitat River Master Plan
- Yakima/Klickitat Fisheries Project (YKFP or Project)
- U.S. vs. Oregon court decision
- Production Advisory Committee (PAC)
- Technical Advisory Committee (TAC)
- Integrated Hatchery Operations Team (IHOT) Operation Plan 1995 Volume III.
- Pacific Northwest Fish Health Protection Committee (PNFHPC)
- In-River Agreements: State, Federal, and Tribal representatives
- Northwest Power Planning Council Sub Basin Plans
- Washington Department of Fish and Wildlife Wild Salmonid Policy
- Memorandum of Understanding WDFW and YN for Operation of the Klickitat River Hatchery
- 2008-2017 U.S. v. Oregon Management Agreement

3.3 Relationship to harvest objectives.

The hatchery program has been designed to help meet tribal treaty trust obligations as defined by Federal Courts.

A Federal court decision in 1969 (*U.S. vs. Oregon*) ruled that Columbia River Treaty Tribes who signed treaties with the federal government in the 1850s are entitled to half of all harvestable salmon and steelhead destined for the tribes' traditional fishing grounds. This court decision mandated fisheries management cooperatively in a government-to-government relationship between the states of Oregon and Washington and the treaty Indian tribes.

U.S. v. Oregon/Columbia River Compact fisheries Technical Advisory

Committee impact assessments are evaluated through Section 7/10 consultation process. Commercial fishery seasons on the portion of the mainstem Columbia River where the states of Oregon and Washington share a common boundary are regulated by a joint Oregon and Washington regulatory body (the Columbia River Compact). Meetings are held in late January of each year to establish the harvest guidelines for the spring and summer fisheries and in late July to establish guidelines for fall commercial and sport fisheries.

In addition, the program is coordinated with and incorporated into WDFW's Mid Columbia River Region (MCMA) Fish Management and Evaluation Plan (FMEP March 2003 and NOAA 2007).

Because no listed Chinook stocks are present in the Klickitat River, harvest activity impacts on listed Chinook stocks are not applicable. The biological impacts of the program to listed steelhead and bull trout have been reduced by releasing fish at sizes typical of wild, fish, and implementing volitional release strategies that help ensure that fish migrate quickly out of the system. Both actions reduce competition and predation interactions between hatchery and listed fish stocks.

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.

Recent 12-year averages (2000-2012) for the combined terminal fishery averaged 813 spring Chinook. Sport and treaty Indian fisheries have averaged 351 and 462 respectively. See table below.

Klickitat River Terminal harvest 1994-2012

Return Year	Harvest				
		Sport		Tribal	
	Total	Hatchery	Wild	Hatchery	Wild
1994	233	44	7	158	24
1995	140	0	0	122	18
1996	308	97	46	112	53
1997	437	157	113	97	70
1998	149	8	6	76	59
1999	151	60	16	60	15
2000	1,446	233	162	621	430
2001	464	66	58	180	160
2002	787	183	190	203	211
2003	1,740	369	388	479	504
2004	1,126	312	243	321	250
2005	809	322	81	324	82
2006	681	226	0	336	119
2007	337	73	0	159	105
2008	593	121	0	299	173
2009	501	378	0	123	0
2010	584	185	0	371	28
2011	561	477	0	79	5
2012	950	500	0	411	39

3.4 Relationship to habitat protection and recovery strategies.

The program described in this HGMP is consistent with the following habitat and protection strategies:

Klickitat Subbasin Recovery Plan for the Mid Columbia ESU- This plan provides habitat strategies to be used to recover ESA listed steelhead in the Klickitat Subbasin. The hatchery program has considered current and future habitat conditions in sizing program and defining release locations.

Klickitat River Master Plan (2012): This document describes actions needed to protect and restore stream habitat in the Klickitat River as well as the basis for hatchery operations**.**

Yakama Nation Fisheries Program (YNFP):
The Klickitat Watershed Enhancement Project is a BPA-funded watershed restoration project implemented by the Yakama Nation Fisheries Program (YNFP). The YNFP is working in coordination with WDFW, Natural Resources Conservation Service (NRCS), local Conservation Districts, local land trusts,

and Regional Fisheries Enhancement Groups. The project was proposed under the Northwest Power Planning Council's Fish and Wildlife Program and funded by BPA in 1997. The project also solicits and receives significant funding from the Washington Salmon Recovery Funding Board. Initial project restoration projects were located within the Swale Creek and Little Klickitat River watersheds; ongoing projects focus on floodplain and riparian restoration in the mainstem Klickitat and the White Creek watershed. Included in the project scope of work are in-stream structural modifications, re-vegetation of the riparian corridor, floodplain reconnection, and exclusion fencing to prevent channel degradation from livestock. A monitoring program has been initiated to document project success and guide future restoration activities. Future phases of the project will use physical habitat survey and EDT modeling output to guide and prioritization restoration activities.

Subbasin Planning:
A regional Subbasin planning process is a broad-scale initiative that will provide building blocks of recovery plans for listed fish. The spring Chinook hatchery program is designed to be consistent with the goals identified in this plan (NPPC 2004).

3.5 Ecological interactions.

Below are discussions on both negative and positive impacts relative to the Klickitat spring Chinook program.

(1) Salmonid and non-salmonid fishes or species that could negatively impact the program: Klickitat spring Chinook smolts can be preyed upon through the entire migration corridor from the Subbasin to the mainstem Columbia River and estuary. Northern pikeminnows and introduced spiny rays along the Columbia mainstem sloughs can prey on smolts reducing their abundance. In addition, avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons are also known to take large numbers of smolts as they migrate to the ocean. Mammals that can take a heavy toll on migrating smolts and returning adults include harbor seals, sea lions, river otters, and Orcas.

(2) Salmonid and non-salmonid fishes or species that could be negatively impacted by the program: Natural salmon and steelhead populations that co-exist in local tributary areas and the Columbia River mainstem corridor areas could be negatively impacted by program fish. Of primary concern are the ESA -listed endangered and threatened salmonids: Snake River fall-run Chinook salmon ESU (threatened); Snake River spring/summer-run Chinook salmon ESU (threatened); Lower Columbia River Chinook salmon ESU (threatened); Upper Columbia River spring-run Chinook salmon ESU (endangered); Columbia River chum salmon ESU (threatened); Snake River sockeye salmon ESU (endangered); Upper Columbia River steelhead ESU (endangered); Snake River Basin steelhead ESU (threatened); Lower Columbia River steelhead ESU (threatened); Middle Columbia River steelhead ESU (threatened); and the Columbia River distinct population segment of bull trout (threatened). 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 net effect difficult. See also section 2.2.3 of this document for a description of ecological interactions.

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

Other wild and hatchery salmonids may provide nutrients to the Klickitat River upon their return as adults. These carcasses may increase stream productivity, which in turn may increase food abundance for spring Chinook. Benefits are expected to be minor as smolts are not expected to remain within the Subbasin for more than ~1-week after release.

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

Aquatic and terrestrial species that consume salmonids will benefit from the continued release of fish from this program. Common species that may benefit include northern pikeminnow, smallmouth and largemouth bass, gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons, harbor seals, sea lions, river otters, bear and killer whales (Orcas). Additionally, salmon carcasses act as a source of fertilizer that benefit riparian plants and return nutrients to the stream.

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.

Spring water from Indian Ford A Springs and gravity-intake-fed river water supply most of the water for this program, although there are several non-fish bearing streams near the hatchery grounds that could be used. Indian Ford Springs provide up to 7,000 gpm of good quality water at 48 –52 degrees F. The river intake supplies up to 7,000 gpm of river water. West bank river pumps (that have only been used on a limited emergency basis) can provide up to 3,000 gpm surface water. Spring water is used for the incubation and early rearing of all juveniles. In late summer, river water is currently used for coho acclimation in Pond 25, located on the east bank of the hatchery. Spring Chinook can be reared in Pond 26, which is supplied with spring water from Wonder Springs, approximately one-half mile downstream and across the river from the main hatchery. Ponds 24 is also used for spring Chinook acclimation and is supplied by both spring and re-use water from hatchery raceway banks.

The source water used for the final rearing of spring Chinook smolts will change from its current Indian Ford spring water to surface water. Conversion of the Pond#25 to a sediment settling basin, will allow for pumped river water to be piped to a bank of circular tanks where the spring Chinook production would be reared for volitional release. Pumps will meet NMFS screen compliance.

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.

Potential Hazard	Risk Aversion Measure
Hatchery water withdrawal	Water rights total 6000 – 8000 gpm from the gravity intake with another 3,000 pumped from the river. Water rights are formalized through trust water right from the Department of Ecology. Monitoring and measurement of water usage is reported in monthly NPDES reports.
Intake/Screening Compliance	Intake structures were designed and constructed to specifications at the time the Klickitat facility was constructed. The Mitchell Act Intake and Screening Assessment (2002) has identified design and alternatives needed to get existing structures in compliant including intake screens and velocity sweeps which are not in compliant with NOAA fish screening standards.
Hatchery effluent discharges. (Clean Water Act)	This facility operates under the "*Federal Aquaculture Facilities and Aquaculture Facilities Located in Indian Country within the Boundaries of the State of Washington*" National Pollution Discharge Elimination System (NPDES) general permit which conducts effluent monitoring and reporting and operates within the limitations established in its permit administered by the Environmental Protection Agency (EPA). WAG 13-0021. Monthly and annual reports on water quality sampling, use of chemicals at this facility, compliance records are available from EPA. Discharges from the cleaning treatment system are monitored as follows: *Total Suspended Solids (TSS):* Collected 1 to 2 times per month on composite effluent, maximum effluent and influent samples. *Settleable Solids (SS):* Collected 1 to 2 times per week on effluent and influent samples. *In-hatchery Water Temperature* - Daily maximum and minimum readings.

Section 5. Facilities

5.1 Broodstock collection facilities (or methods).

Broodstock will be collected at Lyle Falls, Castile Falls, and (possibly) the Klickitat River Hatchery. Adult fish used for broodstock will be collected randomly from the run-at-large to ensure that the entire run-timing is perpetuated in the hatchery-origin component of the composite NOR/HOR population. The proportion of the NOR run taken for broodstock may exceed the recommended 25% during early phases of the reformed program development. This may occur under circumstances where the NOR run size is less than 400 returning adults. The program will need to collect ~68 NOR adults annually during phase I of the broodstock transition period and ~138 NOR adults in later phases. By doing so, the program will produce an adequate number of adult returns needed for the continued transition of the remainder of the program in the out years. In addition, F1 adult returns from the NOR x NOR crosses will be needed for the upper Basin re-colonization by using adults outplants on the spawning grounds. Once the program has been fully transitioned to the new hatchery stock and adult outplants in the upper Basin are no longer necessary, the percentage of NOR adults taken for broodstock will be limited to 25% of the NOR run.

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

Adults transported following YKFP Roza Trap/CESRF Protocols (Hager and Costello 1999)

5.3 Broodstock holding and spawning facilities.

All adults trucked or volitionally entering traps are held till maturity in the adult holding pond. These fish are inoculated up to three times during holding with Erythromycin to retard BKD. All fish are spawned directly from the holding pond and resulting eggs are fertilized and transported to the hatchery building. Each female is sampled for BKD levels and the resulting eggs are incubated separately until ELISA results are known.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
1	Concrete	9,600	40	60	4	1,400

5.4 Incubation facilities.

Incubator Type	Units (number)	Flow (gpm)	Volume (cu.ft.)	Loading-Eyeing (eggs/unit)	Loading-Hatching (eggs/unit)
FAL	325	184	NA	4,000	6,500

5.5 Rearing facilities.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Flow Index	Max. Density Index

11	Concrete	3,500	100	10	3.5	250	NA	NA
1	Hypolon Release Pond	29,925	190	45	3.5	55	NA	NA
1	Earthen release pond	24,500	175	40	3.5	6,000	NA	NA

5.6 Acclimation/release facilities.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Flow Index	Max. Density Index
11	Concrete	3500	100	10	3.5	250	1.85	.20
1	Hypolon Release Pond	29925	190	45	3.5	55	Na	Na
1	Earthen release pond	24500	175	40	3.5	6000	Na	Na

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

None reported for this program.

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.

Potential Hazard	Risk Aversion Measure
Equipment failure/Water loss	Multiple water sources are available. To secure the spring water delivery there is need to re-direct from the aged under-river pipe to the newly constructed pipe through the 2010 vehicle bridge. These spring sources are non-fish bearing. Three torpedo type river pumps (west bank) with NMFS compliant screens are used on an emergency basis. River intake water (east bank) will flow into the former Pond #25. Pond #25 will be converted to a sediment settling basin. NMFS-compliant pumps will deliver water to circular raceways on the west bank via the 2010 vehicle bridge. The river intake and bypass channel will be modified to ensure safe egress for juvenile fish entering the system.
Flooding/Water Loss	The facility is sited to minimize the risk of

	catastrophic fish loss from flooding and set up with low water alarm probes in strategic locations to prevent fish loss due to loss of water. Alarm systems are monitored 24/7 with staff available on-station to respond to problems.
Disease Transmission	USFWS fish health guidelines are followed. Fish Health Specialists conduct inspections monthly and problems are managed promptly to limit mortality and reduce possible disease transmission.

Section 6. Broodstock Origin and Identity

6.1 Source.

Broodstock to be used in the program are trapped from the run-at-large at Lyle Falls, Castile Falls, and the Klickitat River Hatchery adult trap.

6.2.1 History.

Broodstock Source	Origin	Year(s) Used	
		Begin	End
Klickitat Spring Chinook	H	1988	

Broodstock used in the program since 1988 originated from adults returning to the Klickitat Hatchery trap. No other source of broodstock has been used since that time. Klickitat origin spring Chinook adults will continue to be used as hatchery broodstock into the future.

6.2.2 Annual size.

The average annual natural return to the Klickitat basin is 531 (range 66-2035) for 1977-2012 return years, using run reconstruction (harvest plus redd-count-based escapement) methods. Mark-recpature estimates for 2007-2012 yield an average run size at Lyle Falls of 527 fish, indicating a slightly larger run size to the mouth of the Klickitat after accounting for harvest below Lyle Falls on the lower Klickitat River. The broodstock collection goal is 549 fish – 138 NOR and 411 hatchery origin (50% males, 50% females).

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

Historically, only marked fish were used as broodstock. However, with integration of this program, ~68 wild (adipose present) Chinook will be initially taken for broodstock in phase I of the transition beginning in 2014. Based on the recent 5-year mark-recapture estimate average (2007-2011) of NOR spring Chinook returning to Lyle Falls (526), 13.5% of the natural run will be taken for broodstock in initial phases. Because spring Chinook eggs may need to be culled to reduce BKD levels, more natural-origin adults may be needed for broodstock. The proportion of the NOR run taken for broodstock may exceed the recommended 25% during early phases of the reformed program development. This may occur under circumstances where the NOR run size is less than 400 returning adults. The program will need to collect ~68 NOR adults annually in the initial years of the broodstock transition. By doing so, the program will produce an adequate number of adult returns needed for the continued transition of the remainder of the program in the out years. In addition, F1 adult returns from the NOR x NOR crosses will be needed for the upper Basin re-colonization by using adults outplants on the spawning grounds. Once the program has been fully transitioned to the new hatchery stock and adult outplants in the upper Basin are no longer necessary, the percentage of NOR adults taken for broodstock will be limited to 25% of the NOR run.

6.2.4 Genetic or ecological differences.

Marshall (2000) found substantial genetic divergence between the hatchery and natural components of the population. More recent analysis (Hess et al. 2011), however, finds that the hatchery and natural-origin fish are quite similar and that some introgression has occurred between the stream-type Klickitat spring Chinook population and ocean-type Chinook stocks (likely Wells Hatchery summer Chinook that were released in the Klickitat in the late 1970s). This analysis points to past hatchery practices (possible incorporation of returning summer Chinook into spring Chinook brood mating, which has been discontinued) that likely initiated this interbreeding, and to the fact that the introgressed genotype persists in much of the hatchery and wild spring Chinook population with an unknown effect on fitness. Additional research is occurring to determine the effects; future broodstock collection under this program will be aimed at minimizing and, to the extent possible, reversing these effects.

6.2.5 Reasons for choosing.

Fish propagated through the program represent the indigenous Klickitat River spring Chinook population which is assumed to possess the biological attributes adapted to the Klickitat 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.

- Adult trapping is monitored daily for incidental capture of listed steelhead and bull trout; ESA-listed fish are identified, thenquickly sampled and returned to the river.
- The new Lyle Falls fish ladder and trapping facility will be designed to meet NMFS fish handling criteria which should reduce adverse impacts to listed fish.

Section 7. Broodstock Collection

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

Adults

7.2 Collection or sampling design

Adults are captured by traps that are in operation from late March through August. Adults volunteering into the hatchery facility may also be used as broodstock. Broodstock will be collected randomly from the run at large over this time period.

7.3 Identity.

Mark-recapture studies conducted at the Lyle adult trap suggest straying into the Klickitat is generally not observed for spring-run Chinook. Therefore, identifying stock-of-origin will not be necessary. Distinguishing NORs from HORs will rely on the presence of PIT-tags, coded wire tags, adipose-clip or elastomer tags. All hatchery fish will be marked with an adipose fin clip or an elastomer tag. A subset of the juveniles will also be coded-wire-tagged.

7.4 Proposed number to be collected:

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

549 adults at a 1:1 female to male ratio in final program phase. 138 natural-origin and 411 hatchery origin.

7.4.2 Broodstock collection levels for the last twelve years, or for most recent years available.

Year	Adults			
	Females	Males	Jacks	Eggs
Planned	250	250	Na	
1995	288	196	1697	947,000
1996	346	204	57	1,137,400
1997	603	226	6	1,837,000
1998	218	102	55	764,200
1999	265	210	342	880,280
2000	644	321	48	1,582,100
2001	271	138	352	1,006,900
2002	434	230	213	1,636,000
2003	267	233	23	1,138,800
2004	982	584	871	1,087,750
2005	262	233	317	903,275
2006	361	330	95	1,274,350
2007	233	212	129	771000
2008	128	219	228	414200
2009	428	505	784	1466800
2010	447	431	243	1189400
2011	375	339	315	752951
2012	342	394	310	687800

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

Surplus hatchery fish will be distributed to tribal members, released back to the

river to support local fisheries, or planted in the river as carcasses for nutrient enhancement. If fish are released back to the river, care will be taken to maintain the proper proportion of hatchery fish on the spawning grounds. If carcasses are planted for nutrient enhancement, fish health protocols will be followed (e.g. heating to adequate temperature for pathogen reduction, fish health specialist monitoring).

7.6 Fish transportation and holding methods)

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
1	Concrete	9,600	40	60	4	1,400

Spring Chinook broodstock collected are held to maturity in holding ponds at the Klickitat River Hatchery. Fish are held in a combination of spring, well, and river water. Fish are monitored for pre-spawning mortality which historically has been less than 12%. Adults will be injected with Erythromycin-200 at a dosage of 20-30 mg/kg of body weight upon capture and may receive additional treatments during holding in the even of disease outbreaks.

The transport protocols defined in Hager and Costello (1999) will be followed. Transport time from trapping facilities to the adult holding ponds will be less than 1 hour.

7.7 Describe fish health maintenance and sanitation procedures applied.

Adults will be injected with Erythromycin-200 at a dosage of 20-30 mg/kg of body weight upon capture (Hager and Costello 1999).

7.8 Disposition of carcasses.

The carcasses of adult fish that had 21 days to metabolize erythromycin injections prior to spawning will be planted into local streams to increase nutrients. If carcasses are planted for nutrient enhancement, fish health protocols will be followed (e.g. heating to adequate temperature for pathogen reduction, fish health specialist monitoring). Carcasses of fish injected within 21-days of spawning will be buried in a locally identified upland landfill.

7.9 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to <u>listed</u> natural fish resulting from the broodstock collection program.

All trapped listed species are identified, quickly sampled and returned to the river. Trapping facilities are designed to NMFS criteria to minimize handling stress and mortality.

Section 8. Mating

8.1 Selection method.

Cohorts are used from the entire run cycle with males and females available on a given day mated randomly,. This practice is applicable to both NOR- and HOR- designated spring Chinook populations. NOR adults will be spawned with other NOR adults, and HOR adults will be spawned with HOR adults.

8.2 Males.

Males will be used to achieve a 1:1 spawning ratio whenever possible. Jacks will be represented based on the proportion of jacks observed in the wild population.

8.3 Fertilization.

Eggs are mixed with milt and water hardened with iodophor at a 1:600 concentration. The carcass of each female spawned is individually numbered and the eggs are kept separate from all other females. Each carcass is sampled for BKD levels and eggs are not co-mingled until the ELISA results are known and segregation on BKD levels is possible. Moderate to High ELISA groups will be culled and destroyed.

8.4 Cryo-preserved gametes.

Cryo-preserved gametes are not used.

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

Broodstock are selected at random from throughout the wild spring Chinook run. Spawning is done randomly based on availability of ripe fish. Matings are done on a 1:1 sex ratio, i.e. one male and one female. Factorial matings of 2x2 crosses will be utilized to prevent genetic population impacts. DNA samples will be collected from both the natural and hatchery components of the run to track to detect changes in allele frequency or presence.

Section 9. Incubation and Rearing.

9.1.1 Number of eggs taken and survival rates to eye-up and/or ponding.

Historical estimates of egg take and survival rates are presented below. The new program, at full implementation, will take on average 950,000 eggs.

Year	Egg Take	Green-Eyed Survival (%)	Eyed-Ponding Survival (%)	Egg Survival Perfor-mance Std.	Fry-fingerling Survival (%)	Rearing Survival Perfor-mance Std.	Fingerling-Smolt Survival (%)
1995	947,000	95	97.60	NA	95.10	NA	96.00
1996	1,137,400	97.50	98.60	NA	97.30	NA	85.85
1997	1,837,000	98.20	99	NA	97.20	NA	81.11
1998	764,200	95.30	98.70	NA	96.20	NA	86.36
1999	880,280	96.10	99	NA	97.10	NA	95.22
2000	1,582,100	96	97.25	NA	98	NA	93.70
2001	1,006,900	96.59	92.30	NA	98.45	NA	90.2
2002	1,636,000	97.85	92.30	NA	99.4	NA	86.0
2003	1,138,800	98.16	89.68	NA	98.7	NA	94.9
2004	**1,087,750**	94.29	92.22	NA	97.9	NA	95.3
2005	903,275	94.67	92.43	NA	99.8	NA	96.6
2006	1,274,350	96.48	92.39	NA	95.5	NA	93.8
2007	771,000	95.37	92.39	NA	99.7	NA	98.2
2008	414,200	97.99	92.43	NA	99.5	NA	99.5
2009	1,466,800	97.35	92.31	NA	95.9	NA	99.6
2010	1,189,400	96.65	92.29	NA	98.0	NA	99.0
2011	752951	96.08	92.38	NA	97.52	NA	96.0
2012	687800	96.10	93.26	NA	99.52	NA	NA

NA = Not available

9.1.2 Cause for, and disposition of surplus egg takes.

Surplus eggs may result from unexpected variability in female fecundity or pre-spawn survival rates. Surplus eggs from NOR adults will be incorporated into the on-station release for that year. Surplus eggs from HOR origin fish will be destroyed and buried in the landfill.

9.1.3 Loading densities applied during incubation.

FAL vertical incubators are used for eyeing and hatching spring Chinook eggs at the Klickitat Hatchery. Eggs are loaded at the rate of the eggs from one female per tray to eyeing, and 6,500 eggs per tray for hatching. Average egg

size is approximately 1,500 eggs per pound, with a great deal of variation expected.

9.1.4 Incubation conditions.

Integrated Hatchery Operations Team (IHOT) species-specific incubation recommendations are followed for water quality, flows, temperature, substrate and incubator capacities. Harmful silt and sediment is cleaned from incubation systems regularly while eggs are monitored to determine fertilization and mortality. Incubation water is from a spring source and temperature is monitored by thermograph and recorded and temperature units (TU) are tracked for embryonic development. Dissolved oxygen content is monitored and have been at acceptable levels of saturation with a minimum criteria of 8 parts per million (ppm). When using artificial substrate, vexar or bio-rings, egg densities within incubation units are reduced by 10%.

9.1.5 Ponding.

Spring Chinook fry are ponded in up to 11 raceways and reared from December through May of the following year. Fry are ponded when 1) a visual inspection of the amount of yolk sac remaining shows the yolk slit closed to approximately 1 millimeter wide (approximately 1,600 TUs) or based on 95% yolk absorption KD factor. At this time, fry are transferred to the appropriate starter raceway usually during the last two weeks of January.

9.1.6 Fish health maintenance and monitoring.

IHOT and USFWS fish health guidelines are followed. Hatchery staff will conduct daily inspection, visual monitoring, and sampling from eye, fry fingerling, and sub-yearling life stages. As soon as potential problems are seen, these concerns are immediately communicated to the Fish Health Specialist. In regular monitoring, Fish Health Specialists conduct inspections monthly. Potential problems are managed promptly to limit mortality and reduce possible disease transmission.

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.

IHOT and USFWS fish health guidelines are followed. Eggs in the Klickitat program are on spring water to maximize egg survival and minimize loss from disease. All eggs brought to the facility (for other programs) are surface-disinfected with iodophore (as per disease policy). All equipment (nets, tanks, boots, etc.) is disinfected with iodophore between different fish/egg lots. Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water. Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens. The incubation room units are protected by separate low water alarms.

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 (1995-2006), or for years dependable data are available.

Year	Egg Take	Green-Eyed Survival (%)	Eyed-Ponding Survival (%)	Fry-fingerling Survival (%)	Fingerling-Smolt Survival (%)
1995	947,000	95	97.60	95.10	96.00
1996	1,137,400	97.50	98.60	97.30	85.85
1997	1,837,000	98.20	99	97.20	81.11
1998	764,200	95.30	98.70	96.20	86.36
1999	880,280	96.10	99	97.10	95.22
2000	1,582,100	96	97.25	98	93.70
2001	1,006,900	96.59	92.30	98.45	90.2
2002	1,636,000	97.85	92.30	99.4	86.0
2003	1,138,800	98.16	89.68	98.7	94.9
2004	1,087,750	94.29	92.22	97.9	95.3
2005	903,275	94.67	92.43	99.8	96.6
2006	1,274,350	96.48	92.39	95.5	93.8
2007	771,000	95.37	92.39	99.7	98.2
2008	414,200	97.99	92.43	99.5	99.5
2009	1,466,800	97.35	92.31	95.9	99.6
2010	1,189,400	96.65	92.29	98.0	99.0
2011	752,951	96.08	92.38	97.52	96.0
2012	687,800	96.10	93.26	99.52	NA

NA = Not available

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

The juvenile rearing density and loading guidelines used at the facility are based on: standardized agency guidelines, life-stage specific survival studies

conducted at other facilities and staff experience. IHOT standards are followed for: water quality, alarm systems, predator control measures to provide the necessary security for the cultured stock, and monitoring of loading and density.

Raceway and pond loading use a flow index of <1.85 (lbs/length/flow) and a density index of 0.2 (length/lbs/volume).

9.2.3 Fish rearing conditions.

NOR fish are reared in raceways 8, 9 and 10, and transferred off-site to upper Klickitat River Basin acclimation ponds for final rearing and volitional release. Production of the HOR yearling cycle takes place in ponds 24 and 26 until release. Temperature, dissolved oxygen and pond turnover rate are monitored. IHOT standards are followed for: water quality, alarm systems, predator control measures (netting) to provide the necessary security for the cultured stock, loading and density. Settleable solids, unused feed, and feces are removed regularly to ensure proper cleanliness of rearing containers. Water temperature regimes are the same as in natural environment.

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.

The daily amount fed is determined by the number of fish in the population and sample weight. Feed is therefore applied at a daily rate ranging from 2.0% of the total population weight per day (fry and small fingerlings) to 0.7% of the total population weight per day (larger fingerlings and smolts). The expected feed conversion efficiency rate is 1.2.

Rearing Period	Length (mm)	Weight (fpp)	Condition Factor	Growth Rate
07.06	94	50.5	1.082	582
08.06	99.8	40.5	1.132	2924
09.06	109.2	29.5	1.183	6127
10.06	116	21.5	1.35	2681
11.06	123.1	18.7	1.307	4579
12.06	124.3	18.1	1.308	3150
01.07	132.7	15.3	1.289	3089

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

Rearing Period	Length (mm)	Weight (fpp)	Condition Factor	Growth Rate
07.06	94	50.5	1.082	582
08.06	99.8	40.5	1.132	2924
09.06	109.2	29.5	1.183	6127
10.06	116	21.5	1.35	2681
11.06	123.1	18.7	1.307	4579
12.06	124.3	18.1	1.308	3150
01.07	132.7	15.3	1.289	3089

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*).

Rearing Period	Food Type	Application Schedule (#feedings/day)	Feeding Rate Range (%B.W./day)	Lbs. Fed Per gpm of Inflow	Food Conversion During Period
1: 12/27/05-2/13/06	Ewos Micro #1	7	1.6	0.021	0.58
2: 2/13/06-2/28/06	Ewos Micro #2	5	1.8	0.039	0.59
3: 2/28/06-5/8/06	Ewos Pacific 1.2 mm	2	1.8	.029	.60
4: 5/8/06-2/5/07	Ewos Vita 1.5 w/boost	1	1.1	0.06	0.77

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

Fish Health Monitoring	Policy guidance includes: *Fish Health Policy in the Columbia Basin*. Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995). A Fish Health Specialist inspects fish programs at Klickitat Complex monthly and checks both healthy and if present, symptomatic fish. Based on pathological or visual signs by the crew, age of fish and the history of the facility, the pathologist determines the appropriate tests. External signs such as lesions, discolorations, and fungal growths will lead to internal examinations of skin, gills and organs. Kidney and spleen are checked for bacterial kidney disease (BKD). Blood is checked for signs of anemia or other pathogens. Additional tests for virus or parasites are done if warranted.
Disease Treatment	As needed, appropriate therapeutic treatment will be prescribed to control and prevent further outbreaks. Yearling spring Chinook receive one prophylactic treatment of pills top coated with erythromycin. Dead fish are collected daily and disposed of at an approved landfill. Fish health and or treatment reports are kept on file.
Sanitation	All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy). All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots. Different fish/egg lots are physically isolated from

	each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water. Tank trucks are disinfected between the hauling of adult and juvenile fish. Footbaths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

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

The migratory state of the release population is determined by fish behavior. Aggressive screen and intake crowding, swarming against sloped pond sides, leaner condition factors, a more silvery physical appearance and loose scales during feeding events are signs of smolt development. Multiple smolt events can also be triggered by environmental cues including daylight increase, a spike in the water temperature and spring freshets.

Starting with the releases in 2009, juvenile ATP-ase activity will be monitored to better identify the onset of smoltification and establish release schedule.

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

Rearing methods and techniques found to be effective at the CESRF will be incorporated into this program as they become proven.

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.

Limit out-of-basin transfers of fish or eggs for use as broodstock, except in rare circumstances. Reduces risk of disease introductions to Subbasin.

Protocols for population size, fish health disinfection and genetic guidelines followed.

USFWS and IHOT hatchery guidelines are followed for rearing, release, and fish health parameters.

Section 10. Release

10.1 Proposed fish release levels.

Age Class	Max. No.	Size (ffp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Water-shed	Eco-province
Yearling	800,000	12-15	April	Klickitat	68	Klickitat	Columbia Gorge

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

The 600,000 HOR program and the 200,000 NOR program fish on-station groups will be volitionally released from circular rearing tanks at the Klickitat hatchery (RKm 68) in April.

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

Release Year	Fingerling Release			Yearling Release		
	No.	Date (MM/DD)	Avg Size (fpp)	No.	Date (MM/DD)	Avg Size (fpp)
1996	223000	5/28-5/29	54	610000	2/8-2/9;3/1-3/16	6
1997	382500	5/27-5/29	49.5	580600	3/1-3/15	7
1998	343380	5/6, 5/7, 6/30	77	584500	3/2-3/12	7
1999	40600	5/11	81	538000	3/1, 3/2	7.5
2000	190842	5/2,5/3,8/9,8/17	63.6	562000	3/1-3/10, 3/20-3/31	6.4
2001	252098	5/13, 7/22	51.4	615000	3/7-3/9	7.7
2002	223298	5/13	51.4	605000	3/8-3/10	7.7
2003	286,400	5/6,8/6	71/36	607500	3/5-3/8	8.0
2004	348,910	4/4, 5/10	70/60	609,800	3/1 – 3/5	13.7
2005	269,800	5/5 – 5/17	68	628,196	3/1 – 3/7	14.5
2006	155,230	5/21, 6/12, 7/12	58/68/56	607,900	3/6 – 3/10	14.1
2007	21830	7/12	56	606000	3/5 -3/9	16
2008	39,422	5/14, 6/20, 6/21	90, 77	449,232	3/3 -3/6	14
2009	N/A	N/A	N/A	624,700	2/25-2/27	14
2010	N/A	N/A	N/A	419,475	3/9 -3/11	16
2011	N/A	N/A	N/A	621,375	3/15-3/22	13
2012	N/A	N/A	N/A	621,925	3/13-3/16	14

10.4 Actual dates of release and description of release protocols.

See above

10.5 Fish transportation procedures, if applicable.

NA

10.6 Acclimation procedures (*methods applied and length of time*).

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

The 200,000 juveniles derived from 100% NOR broodstock (conservation program) will receive an eye elastomer tag in addition to 17% receiving a CWT. The 600,000 juveniles derived from HOR broodstock (harvest program) will be adipose-clipped in addition to 17% receiving a CWT. Distinguishing adult HORs from each of the release groups is a key element for future broodstock collection strategies and management of the integrated spring Chinook population. In time, the current segregated hatchery stock will be phased out as surplus HORs become available from the conservation program.

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

Surplus NOR juveniles will be transported and released above Castile Falls. All surplus HOR-origin juveniles will also be released on-site. However, before the surplus juveniles are released, the Hatchery Complex Manager will contact the Senior Fisheries Biologist to apprise him/her of the situation. He then consult will with appropriate regional co-managers/NOAA to get recommendations for fish disposition. The Hatchery Complex Manager will instruct hatchery personnel to implement the recommendation.

10.9 Fish health certification procedures applied pre-release.

Prior to release, fish are given a fish health exam. If abnormal behavior or mortality is observed, the staff contacts the Area Fish Health Specialist. The Fish Health Specialist examines affected fish and recommends the appropriate treatment. Reporting and control of fish pathogens are done in accordance with the Co-managers' Fish Disease Control Policy. All fish are examined for the presence of "reportable pathogens" as defined in the PNFHPC disease control guidelines, within 1 to 3 weeks prior to release (http://www.fws.gov/pnfhpc/).

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

If the program is threatened by ecological or mechanical events, the Complex Manager will contact and inform regional management of the situation. Based on a determination of a partial or complete emergency release of program fish, if an on-station emergency release is authorized, personnel will pull screens and sumps and fish will be force-released into the Klickitat River. No release of fish will occur without a review by YN Fisheries Management.

In the event of a water system failure, screens will be pulled to allow fish to exit the ponds. In some cases, fish can be transferred into other rearing vessels to prevent an emergency release. The YN also has emergency response procedures for providing back-up pumps, transport trucks, etc. In cases of severe flooding, the screens will not be pulled. Past experience has shown that the fish tend to stay on the bottom of the pond during flooding events; the only fish that leave are those that are inadvertently swept out.

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

- The program calls for production and release of smolts only. Fish culture practices and volitional releases encourage rapid seaward migration with minimal rearing or delay in the rivers. This will limit interactions with naturally produced steelhead and bull trout juveniles.
- YN fish health and operational concerns for Klickitat Hatchery programs are regularly communicated to USFWS and other co-managers for risk management or needed treatment.

Section 11. Monitoring and Evaluation of Performance Indicators

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

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

Harvest Contribution: A portion of all hatchery releases will be tagged with a CWT so that harvest rates in both ocean and freshwater fisheries can be tracked. Additionally, the YN and WDFW monitor and track tribal and sport harvest in the Klickitat River to develop estimates of in-river harvest levels.

Straying: A portion of the hatchery fish releases will be tagged with elastomer and CWT tags. Regional sampling protocols call for the collection and reporting of cwt's to the RMIS database. YN staff will query this database for tags captured outside of the Klickitat River. CWT fish located in basins outside of the Klickitat will be considered as strays. Additionally, YN staff will request all agencies conducting fish run research or monitoring to report any elastomer tags found.

Smolt-to-Adult Survival (SAR): SAR values will be calculated by surveying for tagged fish in ocean and freshwater fisheries, spawning surveys, and broodstock collection facilities.

PNI: Spawning and carcass surveys will be used to document the number and proportion of hatchery fish on the spawning grounds. In addition, the proportion of the NOR run used as broodstock will also be monitored at the

hatchery. These two pieces of data will be used to calculate a PNI value for the composite stock (hatchery and natural).

Water Diversion Screens: Facility water intakes will be designed in accordance with NMFS standards. Velocity measurements will be taken at each screening system each year to ensure the criteria are being met. Screens will also be inspected each year for any problems (missing panels, debris, etc.) and corrective actions taken.

Hatchery Operations: An annual report will be written documenting program operations, disease problems, treatment, broodstock collection, number of fish released, fish size, and release date.

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

Staff and funding levels as outlined in the Klickitat River Anadromous Fisheries Master Plan (in draft) should be sufficient to implement the M&E program.

11.2 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

Survey techniques used to monitor adult spawning in the natural environment and estimate PNI are designed to minimize disturbance to active steelhead spawners. All trapped listed species are identified, quickly sampled and returned to the river. Trapping facilities are designed to NMFS criteria to minimize handling stress and mortality.

Section 12. Research

12.1 No research activities are proposed for spring Chinook that will affect listed fish populations in the Klickitat River, other than monitoring and evaluation activities described above and in Appendix 1.

Section 13. Attachments and Citations

13.1 Attachments and Citations:

Busack, C., K. Currens, T. Pearsons, and L. Mobrand. 2005. "Tools for Evaluating Ecological and Genetic Risks in Hatchery Programs", 2004 Final Report, Project No. 200305800, 91 electronic pages, (BPA Report DOE/BP-00016399-1).

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Klickitat Hatchery Conceptual Design Study. 2010. Yakima/Klickitat Fisheries Program. Toppenish, WA

Klickitat Subbasin Recovery Plan for Middle Columbia River Steelhead ESU. Working Draft NOAA-Portland 2007.

Marshall, A.R. 2000. Genetic analysis of Chinook populations in the Klickitat River. Unpublished draft report to Yakima Klickitat Fisheries Project, WDFW Genetics Unit. Olympia, WA.

Narum S. R., M. Powell, R. Evenson, B. Sharpe and A. Talbot. 2006. Microsatellites Reveal Population Substructure of Klickitat River Native Steelhead and Genetic Divergence from an Introduced Stock. North American Journal of Fisheries Management **26**:147-155.

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Zendt, J., N. Romero, S. Keep, and M. Babcock. 2013. Klickitat Subbasin Monitoring and Evaluation - Yakima/Klickitat Fisheries Project, 2010-2012 Annual Report. BPA Document ID # P132813.

https://pisces.bpa.gov/release/documents/documentviewer.aspx?doc=P132813

Section 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

14.1 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:_____

Section 15

ADDENDUM A. PROGRAM EFFECTS ON OTHER (AQUATIC OR TERRESTRIAL) ESA-LISTED POPULATIONS

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.

No permits in place for this new program. They will be developed through consultation with appropriate agencies as facilities and programs are developed.

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

Hatchery operations may impact federally listed Klickitat River bull trout (*Salvelinus confluentus*). Bull trout are listed as Threatened by the USFWS. The USFWS has designated the West Fork Klickitat River and Klickitat River reaches adjacent to the Yakama Indian Reservation as Critical Habitat (Federal Register 2005). Stream habitat in the Klickitat River Subbasin has been impacted by human activities associated with agriculture, logging, recreation, and urban development.

Hatchery facilities are located both within and near the Klickitat River. Water for rearing anadromous fish at the Klickitat River hatchery is diverted from the river. New juvenile acclimation sites are being developed at the Wahkiacus Hatchery (RKm 27) that will disturb upland and riparian habitat near the stream channel. A diversion structure will also be built at this facility to provide water for acclimating hatchery smolts.

Other listed or candidate species that may be impacted by the construction and operation of the Wahkiacus Hatchery and Acclimation Facility Creek include:

Oregon Spotted Frog (*Rana pretiosa)*	Candidate
Bald Eagle (*Haliaeetus leucocephalus)*	Threatened
Northern Spotted Owl (*Strix occidentalis)*	Threatened

The possible impacts from the construction and operation of new facilities have not been quantified.

15.3) Analyze effects.

Bull Trout

Possible hatchery operational effects on listed bull trout in the Klickitat River are described below. The effects are expected to be on-going while the hatchery program remains in place.

Water diversion: Water is diverted from the Klickitat River to operate the Klickitat River Hatchery. This action may result in a slight decrease in the amount of habitat (0.25 miles of stream) and quality of stream habitat that will be de-watered. The loss in habitat may result in a decrease in bull trout abundance. However, because bull trout are primarily found in the West Fork Klickitat River and tributaries higher in the Subbasin than the location of the hatchery, impacts to bull trout are expected to be minor.

Diversion Screens: The Klickitat River Hatchery water intakes will be screened to meet NMFS criteria for fry. Impacts to juvenile bull trout are expected to be minor, if at all.

Waste and Pollutants: The facility will under the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit which conducts effluent monitoring and reporting and operates within the limitations established in its permit administered by the Washington Department of Ecology (DOE). The limitations listed in the permit are assumed to be protective of water quality and therefore the hatchery waste water is likely to have little impact on bull trout.

Disease: Outbreaks in the hatchery may cause significant adult, egg, or juvenile mortality. Over the years, rearing densities, disease prevention, and fish health monitoring have greatly improved the health of fish in the programs at the Klickitat River Hatchery. Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995) Chapter 5 have been instrumental in reducing disease outbreaks. Fish are planted and transferred after a fish health specialist has determined the populations' health. The level of indirect take of bull trout from disease is unknown.

Broodstock Collection: Broodstock will be collected at Lyle Falls, Castile Falls and the Klickitat River Hatchery. Trapping facilities will be designed in accordance with NMFS criteria; impacts to listed fish species will be minimal.

Release of Juveniles: The program will release 800,000 spring Chinook into the Klickitat River each year. These fish may compete with and prey on juvenile bull trout. Smolt length at release will range from 139 to 155 mm. NMFS and USFWS postulate that smolts consume prey whose length is 33% of the smolts' body length. It is expected that hatchery spring Chinook released at 139 to 155 mm could prey upon juvenile bull trout that are 46 to 51 mm in length. However, because almost all juvenile bull trout production is located in the West Fork Klickitat River, hatchery spring Chinook released in the mainstem Klickitat River are unlikely to encounter juvenile bull trout.

Food: The carcasses of naturally spawning spring Chinook adults returning to the Subbasin may increase stream productivity through the addition of ocean-derived nutrients. Increased productivity may result in an increase in food availability to both juvenile and adult bull trout. Offspring of naturally spawning coho may also provide a food source for bull trout.

Monitoring and Evaluation: Smolt trapping may be used to determine that hatchery spring Chinook juveniles migrate quickly through the system after release. Some bull trout may be captured and handled at the trapping facilities.

Oregon Spotted Frog

Neither construction nor operations of hatchery facilities are likely to impact this species. The only known population of Oregon Spotted Frog in the Klickitat River Subbasin is located in the Conboy Lake National Wildlife Refuge (NWR) managed by USFWS (Klickitat Subbasin Plan 2004). The refuge is located approximately 10 miles east of Trout Lake and 7 miles southwest of Glenwood in the Glenwood Valley/Camas Prairie area.

Bald Eagle

Bald eagles can be found throughout the year in the Klickitat River Subbasin. Because bald eagles feed on salmon, increased hatchery production should result in an increase in food for this species as a result of more adult fish returning to the Subbasin. Eagles could experience disturbance during some hatchery activities such as fish transport, but the effect is expected to be short-term and minor in nature.

Northern Spotted Owl

No facilities will be located in nor activities conducted in areas inhabited by the Northern Spotted Owl or in suitable owl habitat.

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15.4 Actions taken to minimize potential effects.

Bull trout

Diversion Screens: All intake screens will be built or updated to meet NMFS screen criteria for fry.

Waste and Pollutants: All terms and conditions associated with the NPDES Permit will be implemented and followed.

Broodstock Collection: Broodstock collection facilities will be designed to USFWS and NMFS standards thereby reducing the probability that bull trout will be harmed if collected in these facilities.

Monitoring and Evaluation: Bull trout collected during juvenile trapping operations will be released unharmed to the stream.

Oregon Spotted Frog

Prior to constructing new facilities or upgrading existing facilities, the stream and riparian areas near proposed sites will be surveyed for the presence of the Oregon Spotted Frog.

If this species is found, YN will coordinate with USFWS staff to develop mitigation and protection measures.

Bald Eagle

New facilities will not be located near bald eagle nests.

Northern Spotted Owl

No facilities are located in Northern Spotted Owl habitat; no impacts are expected.

15.5 References

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NPPC 2004. Klickitat Subbasin Plan. Prepared for the Northwest Power and Conservation Council. Prepared by the Yakama Nation, Klickitat County, and Washington Department of Fish and Wildlife.

Yakama Nation 2012. *Draft* Klickitat River Anadromous Fisheries Master Plan, Yakima/Klickitat Fisheries Program. Toppenish, WA.

Appendix 1- Take Tables

Estimated listed salmonid take levels by hatchery activity.

Steelhead

ESU/Population	Middle Columbia River Steelhead
Activity	Klickitat Hatchery Spring Chinook Program
Location of hatchery activity	Klickitat R. Hatchery
Dates of activity	May – September
Hatchery Program Operator	YN & WDFW under co-managed YKFP

Type of Take	Annual Take of Listed Fish by life Stage (number of fish)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass (a)		50-150	100	
Collect for transport (b)				
Capture, handle, and release (c)		500-2000 wild; 2000-3000 hatchery*	650-950 wild; 800-1000 hatchery**	
Capture, handle, tag/mark/tissue sample, and release (d)		3000-10,000 wild***		
Removal (e.g., broodstock) (e)				
Intentional lethal take (f)				
Unintentional lethal take (g)		190 wild; 150 hatchery	25 wild; 30 hatchery	
Other take (indirect, unintentional) (h)				

* Smolt trapping operations for monitoring purposes
** Although steelhead have not been taken during past hatchery practices, it is anticipated that adult steelhead will be collected and handled at the new collection facilities at Lyle Falls. Mortality occurs only on rare occasions during these operations.
***Stream fish (juvenile steelhead and resident trout) sampling operations

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

Take Table 2. Estimated listed salmonid take levels by hatchery activity.

Bull Trout

ESU/Population	Columbia River Basin DPS Bull Trout
Activity	Klickitat Hatchery Spring Chinook Program
Location of hatchery activity	Klickitat R. Hatchery
Dates of activity	May – September
Hatchery Program Operator	YN & WDFW under co-managed YKFP

Type of Take	Annual Take of Listed Fish by life Stage (number of fish)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass (a)		65*	15*	
Collect for transport (b)				
Capture, handle, and release (c)		5**	5**	
Capture, handle, tag/mark/tissue sample, and release (d)				
Removal (e.g., broodstock (e)				
Intentional lethal take (f)				
Unintentional lethal take (g)				
Other take (indirect, unintentional) (h)				

* Spawner surveys or habitat surveys
**Juvenile and adult trapping operations

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

YAKIMA/KLICKITAT FISHERIES PROJECT - KLICKITAT MONITORING AND EVALUATION PROJECT DESCRIPTION

Action	Overview of Action/Purpose	Description	Location	Anticipated Take (per year)				
				General ESA Approach/Notes	Bull Trout adults	Bull Trout juveniles	Steelhead adults	Steelhead juveniles
Spawning ground surveys	Document the abundance and temporal and spatial distribution of spawners and redds in the Klickitat basin for spring Chinook, fall Chinook, coho, and steelhead.	Conduct spawner surveys via wading and/or rafting within the known geographic range in the Klickitat subbasin. Count individual redds and record location using handheld GPS units. Record counts of live fish and carcasses. Collect biological information from carcasses (length, sex, scale sample, and tag/mark data). Examine carcasses for sex determination, egg/milt retention (percent spawned), and presence of decimal coded wire tags (CWT) tags or external experimental marks. Make attempts to cover the entire known spawning range of each species. Survey each stream reach multiple times (preferably at least 3 survey passes) during the spawning periods.	Throughout Klickitat subbasin (Klickitat River and anadromous-accessible tributaries); approximately 150 river miles of survey reaches	"Take" for this action may include scaring/stressing fish, temporary displacement of fish, and temporary interruption of spawning. Survey timing is as follows: spring Chinook - mid August through early October; fall Chinook - late October through early to mid December; coho - mid October through mid February; steelhead - late January through early June. No mortalities anticipated.	< 5	< 5	< 100	< 50
Adult salmonid monitoring at Lyle Falls Fishway	Collect data on adult salmonids in the Klickitat River to determine fish use, run timing, and estimate abundance.	Operate adult trap in the Lyle Falls fishway. Trap will be operated as flows and debris levels allow. Trap will be checked every 24 hours. Biological data will be collected including fish length, tag inspection, scale sample, and DNA samples. Marks (opercle punches and floy tags) will be administered to assist in subsequent resight/recapture and development of population estimates. Fish are crowded, then lifted and transported (via water-to-water transfer) to handling tanks for biological sampling. Fish are handled and sampled in small tanks using soft mesh knotless netting. Depending on funding, fish may also be PIT-tagged and/or radio-tagged to assist in determination of migration/holding patterns, spawning areas, passage issues, and fishway use. Appropriate anesthesia (generally electronarcosis) will be used; no chemical anesthetic is used due to harvest availability of fish after leaving trap.	RM 2.3 on the Klickitat River; T03N, R12E, Sec. 25 NWSW	"Take" for this action includes fish trapping and handling, collection of biological data and marking/tagging. Mortality only occurs on very rare occasions. Trap is operated year round as flows and debris/bedload levels allow.	< 5	0	600-800 Klickitat wild; 50 Snake R. wild; 800-1000 Klickitat hatchery; 50 Snake R. hatchery; < 3% mortality (Radio tagging: up to 100 wild, 100 hatchery of this total)	0
Adult salmonid monitoring at Castile Falls fishway	Collect data on adult salmonids in the Klickitat River to determine fish use, run timing, and estimate abundance	Operate enumeration facility in the Castile Falls fishway. Facility will be operated as flows and debris levels allow. Facility will be checked on a weekly or biweekly basis. Video and PIT tag detection equipment installed in fishway will be primary means of monitoring fish. Occasional trapping and handling of fish will occur for	RM 64.6 on the Klickitat River; T09N R13E, Sec. 18 SWSW	"Take" for this action includes occasional fish trapping and handling, collection of biological data and marking/tagging. Mortality will likely occur only on very rare occasions. Facility will be operated year round as flows and	0	0	50-100 Klickitat wild; < 2% mortality	0

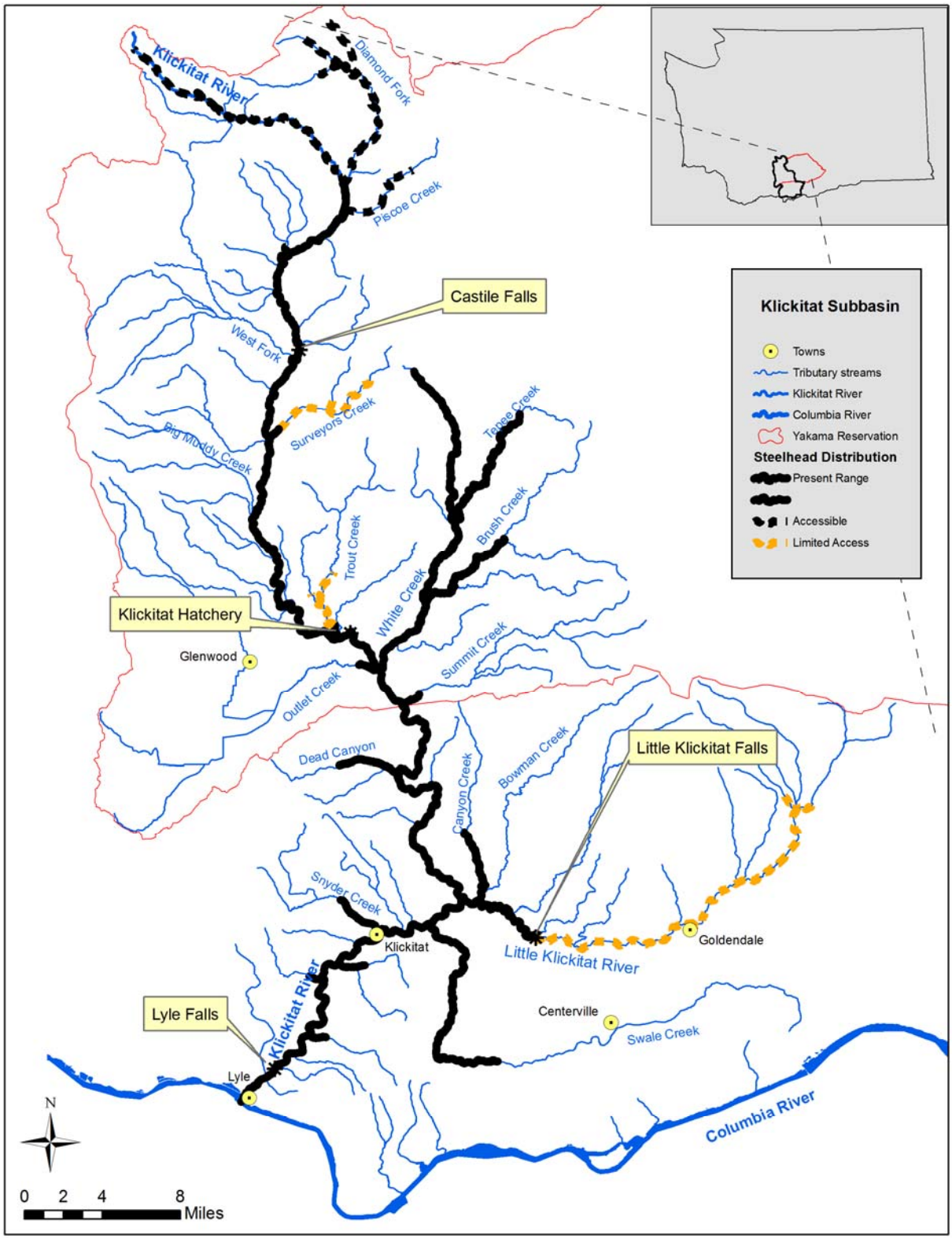
		biological sampling purposes (fish length, tag inspection, scale sample, and DNA samples). When operated as a trap, facility will be checked every 24 hours. Handled fish will be placed in water-filled blackout tubes (PVC tubes with cutout sections) or soft mesh knotless netting; appropriate anesthesia (e.g., electronarcosis or MS-222) will be used.		debris/bedload levels allow.				
Juvenile outmigration monitoring	Continuous monitoring of juvenile outmigration in the upper and lower Klickitat River utilizing rotary screw traps. Information to provide an index of number of smolts, parr, and fry leaving the Klickitat system.	Operate floating rotary screw traps to monitor juvenile (smolt, parr, and fry) outmigration in the upper and lower Klickitat River. Traps will be fished year round (as flows, debris levels, and hatchery releases allow) at the: 1. Lyle Falls trap, 2. Klickitat Hatchery trap, and 3. seasonally (between May and November) at the Castile Falls trap. Calibration studies (mark-recapture trials) will be conducted to estimate trap efficiency and assist in development of smolt production estimates. Environmental and trap data will be recorded along with bio-data on 10 to 30 of each salmonid species represented. Fish will be anesthetized and sampled for length, weight, scales, and DNA. Additional tags or marks may also be administered (fin clips for mark-recapture efficiency testing and PIT tags). The excess and non-salmonid fish will be tallied by species. Depending on funding, 1 or 2 additional smolt traps or instream PIT tag antennas may temporarily be deployed in selected key tributaries (e.g. White Creek).	Lyle Falls (RM 2.3 on the Klickitat River; T03N,R12E, Sec. 25 NWSW) Klickitat Hatchery (RM 42 on the Klickitat River; T06N R13E, Sec. 4 SWNE) Castile Falls (RM 64 on the Klickitat River; T09N,R13E, Sec.19 NENE	"Take" for this action includes fish trapping and handling, collection of biological data and marking/tagging. Mortality only occurs on rare occasions. Lyle Falls and Klickitat Hatchery traps are operated year round (as flows, debris levels, and hatchery releases allow); Castile Falls trap is operated seasonally (generally May to November)	< 5	< 5	< 5 (kelts)	500-2000 wild; 2000-3000 hatchery; < 5% mortality (PIT tagging: up to 1500 wild of this total; PIT tagging may also include an additional 10,000 hatchery smolts tagged at Skamania Hatchery)
Juvenile and resident salmonid population surveys	Determine the spatial distribution, abundance, survival, and migration patterns of salmonids throughout the basin to provide baseline information and evaluate hatchery and habitat actions.	Electrofishing surveys will be conducted in selected key tributary and mainstream reaches. Standard depletion or mark-recapture estimates to determine abundance will be utilized. Snorkel surveys will also be used in selected reaches. Population surveys may be completed in selected reaches pre and post-habitat improvement actions. The number of sites sampled will be determined by time allotted to other field season activities (e.g., habitat surveys). Fish captured will be anesthetized and sampled for length, weight, scales, and DNA. Depending on funding, additional tags or marks may also be administered (e.g., fin clips and PIT tags for survival estimation and juvenile outmigration monitoring).	Throughout Klickitat subbasin; includes White Cr. watershed, other specific locations to be determined	"Take" for this action includes fish capture (via electrofishing), scaring/stressing fish or temporary displacement of fish (during snorkel surveys), handling, tagging, and collection of biological data. Mortality only occurs on very rare occasions. Sampling would generally occur in the summer and early fall.	< 5	< 5	< 5	3000-10000 wild; <3% mortality (PIT tagging: up to 5000 wild of this total)
Scale analysis	Scales are taken at traps and from carcasses encountered on spawner surveys as part of a	Fish scales are taken at screw traps, at the Lyle and Castile adult traps, and from carcasses encountered on spawning surveys. The majority of the scale reading is done by YKFP M&E staff; some scales may be read by WDFW staff.	Same location as screw traps, adult traps, and spawner surveys (above)	No effect – action is scale reading and analysis;	No effect – action is scale reading and analysis	No effect – action is scale reading and analysis	No effect – action is scale reading and analysis	No effect – action is scale reading and analysis

	continuous and ongoing sampling routine to determine age and stock composition of juvenile and adult salmonid stocks in the Klickitat basin.							
Sediment monitoring	Monitor stream sediment loads associated with natural and anthropogenic factors (e.g., logging, agriculture, and road building) which can increase sediment loads in streams utilized by all salmonids in the Klickitat basin.	Gravel samples will be collected and analyzed using Washington State DNR Timber, Fish and Wildlife (TFW) monitoring methodology. McNeil gravel core samples will be collected at 10-12 sites and will be sieved to estimate percentage composition of various substrate particle sizes.	Klickitat River between RM 16 and 88; Diamond Fork Cr. between RM 0 and 12; White Cr. RM 9; Tepee Cr. RM 5	"Take" for this action may include scaring/stressing fish, temporary displacement of fish, and minor localized turbidity increases during gravel sampling. Sampling would occur in the fall (October – November). No anticipated mortalities.	0	0	<5	<10
Water quality monitoring	Continue ongoing water quality monitoring at established and selected new sites.	Record water quality measurements on selected tributaries and within selected habitat survey reaches on a seasonal and as-possible basis. Portable field meters will be used to measure and record the following parameters: temperature, dissolved oxygen, pH, conductivity, and turbidity. Data will be recorded at 36-38 locations, approximately 5-8 times per year at each location. Temperature is also continuously monitored via data loggers placed in streams at these locations.	Approximately 38 locations throughout Klickitat subbasin (Klickitat R. and tributaries)	No effect is anticipated.				
Habitat Surveys	Complete habitat surveys at selected sites and reaches. Quantitative habitat data will provide the foundation for decision-making relative to habitat restoration, as well as refining related attributes of the EDT model. Survey data will also assist in effectiveness monitoring of	Collect baseline data on existing habitat conditions throughout the basin. The habitat inventories will be conducted using YKFP Rapid Habitat Assessment protocols and the Washington State DNR Timber, Fish and Wildlife (TFW) monitoring methodology (modules: Stream Segment Identification, Reference Point Survey, Habitat Unit Survey, and Large Woody Debris Survey). Sites may include previously surveyed sites and/or new sites.	Throughout Klickitat subbasin; specific locations to be determined	"Take" for this action may include scaring/stressing fish or temporary displacement of fish during habitat survey. Surveys generally occur in late spring and summer. No anticipated mortalities.	0	< 50	0	< 100

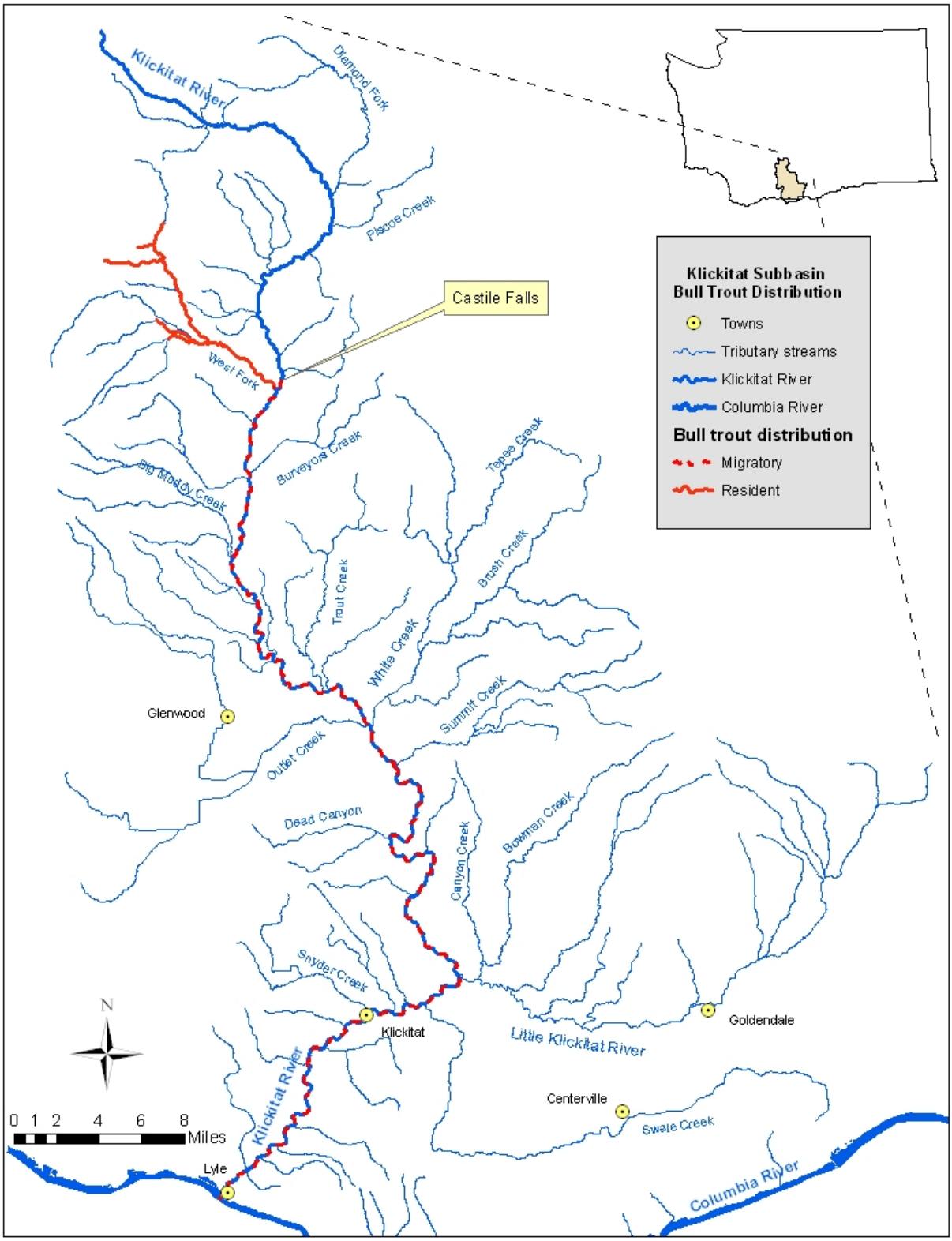
	habitat restoration projects and in other land management planning.							
Genetic data collection, analysis, and synthesis	Provide information on subpopulation structure, geographic variation, and production in order to minimize any effects from hatchery actions.	Genetic samples will be collected from adult salmonids at the Lyle and Castile adult traps, and from juveniles at rotary screw traps. Additional samples may also be collected via stream electrofishing. Samples will be sent to Columbia River Intertribal Fish commission (CRITFC) genetics lab or other genetics labs for analysis. YKFP biologists, in collaboration with CRITFC geneticists, will compile existing data and analyze genetics information. May also include research on phenotypic expression of biologically functional genes (e.g. thermal tolerance and smoltification).	Same location as screw traps, adult traps, and spawner surveys (above) Other locations to be determined throughout Klickitat subbasin.	Take for this action includes fish capture and handling (with non-lethal fin clip, fin punch, or opercle punch sampling) during stream electrofishing and adult trap and screw trap operation. May include some lethal sampling (up to 100 juvenile steelhead per year) for research on phenotypic expression of biologically functional genes; otherwise no mortalities expected.	0	0	0	500-1000 (most of this total included as part of other sampling described above)

Appendix 2 - Steelhead and Bull Trout Distribution

Steelhead Distribution



Bull Trout Distribution



Appendix 3
Klickitat spring Chinook: Integrated program description and implementation schedule

Overview of Klickitat spring Chinook and future program

The existing hatchery/wild composite population has substantially diverged from the original native population due to extensive hatchery introgression over many years. The goal of the Yakama Nation since taking over management of the Klickitat Hatchery is to implement actions that will, over time, improve the quality of the natural-origin population, and by using these fish for brood stock, to also improve the quality of hatchery-origin fish that escape to the natural spawning grounds.

We surveyed spring Chinook carcasses on the spawning grounds from 2005-2012 and observed an average proportion of hatchery-origin spring Chinook spawning naturally of 34% (28 of 82 carcasses). Preliminary radio telemetry results indicate that 15% of hatchery-origin spring Chinook (11 out of 72 fish tagged at Lyle Falls in 2010-2011) spawned in the wild. Very few natural-origin fish are presently used for brood stock. Therefore, we estimate that present PNI levels are likely less than 0.10 (Figure 1). In addition, hatchery-origin brood stock currently used in the Klickitat program have many generations of hatchery ancestry. Present levels of pHOS would require us to use 40-60% natural-origin fish in our brood stock to achieve the stated target proportionate natural influence of 0.67. Monitoring data (see Table 6-15 in 2012 Master Plan) indicate that collection of the number of natural-origin spring Chinook required to achieve target PNI at the Lyle Falls trap is neither possible nor desirable at the present time. Therefore, we intend to implement a phased approach and the following actions, beginning in the spring of 2013, to reduce pHOS and move us toward our goal of improving the quality of natural-origin fish and ultimately increasing the natural population.

- Increase the harvest rate in recreational fisheries above Lyle Falls by cooperating with WDFW to extend the season by 4-6 weeks. We expect this to increase the harvest rate and reduce pHOS initially by about 10% given current levels of natural escapement.
- Maintain or increase existing hatchery-origin adult returns from a reduced juvenile release by implementing actions to increase smolt survival which should in turn increase adult returns. This is an interim measure that we believe is required to affect an immediate increase in the proportion of hatchery-origin fish returning from a relatively small number of natural-origin parents incorporated into the hatchery program brood stock. Table 6-10 in the 2012 Master Plan indicates that only 420,000 smolts were released in 2010; yet adult returns from this release in 2012 were comparable to returns from the average release of about 600,000 smolts in most recent years. We believe that we can substantially improve smolt survival by releasing spring Chinook yearlings at a more normative release time (on or about April 15) compared to late-February-to-mid-March releases presently. We expect the improved survival because fish will be able to take advantage of spill at Bonneville Dam to allow quicker migration past any predatory barriers and more timely arrival to feeding grounds in the lower Columbia River and estuary. We believe we may also see increased survival as reduced release numbers will allow reduced pond rearing densities which should improve the quality of smolts released. Improved survival of hatchery releases should allow us to begin increasing the proportion of one-generation hatchery parents (progeny of natural-origin parents crossed in the hatchery beginning in 2013) incorporated into broodstock beginning in 2018. As

the proportion of returning hatchery-origin fish with reduced hatchery-influence increases, the effects of hatchery-origin fish on the natural spawning grounds should be reduced (Araki et al. 2007a).

Description of phased approach to reforming current program

The All-H-Analyzer (AHA model) was used to quantify the progressive phases that will be required to transition the current hatchery stock to one more compatible with natural production while simultaneously providing sustained harvest opportunities. A total of 4 phases have been identified to fully transition the current hatchery program to the proposed long term program. While an implementation schedule is provided in this analysis, the actual timeline for transitioning from one phase to the next will rely on performance standards for one or more metrics such as adult return rates for hatchery origin Chinook, and abundance trends for the natural population. Thus, the timeline (Tables 3-5) provided represents the quickest possible transition period assuming all performance standards are being met. A synopsis of the program's phased approach is provided below followed by the modeling analysis for each phase describing assumed changes in habitat conditions, hatchery practices, and performance metrics.

Phase I- Implement collection of NOR adults for new hatchery stock (N_1 line).

Approximately 68 NOR adults will be collected during this phase of the program thus, producing a smolt release of ~100,000 yearling smolts. NOR adults will be spawned with NOR adults and differentially marked from the existing hatchery line (H_1 line) to allow unique identification and improved survival through mark-selective fisheries (no adipose clip will be applied). The 2012 Master Plan indicated the broodstock collection rate will not exceed 25% of the natural run, per guidelines recommended by the HSRG. The most recent 5 years of NOR run size estimates at Lyle Falls suggest that collection of 68 adults would result in a collection rate of about 13.5% (10.1% to 16.5%) of the natural population for broodstock annually (Table 1).

Table 1. Estimated natural-origin (NOR) spring Chinook run size and brood collection rate at Lyle Falls adult trap to support an initial integrated hatchery program release of 100,000 smolts (we estimate that 68 adults are required to support this initial program size).

Year	Est. Run	NOR brood collection rate
2007	413	16.5%
2008	416	16.3%
2009	675	10.1%
2010	489	13.9%
2011	636	10.7%
Mean Nat Orig. Brood Take: 13.5%		

Returning adults from the N_1 line will be used as the founder broodstock for the new, H_2 line (long-term harvest component of the program) during phase II of the program. In addition, adults from the N_1 line may be used for re-colonization of the upper watershed above Castile Falls if returning adult numbers allow.

The N_1 program is designed to minimize the broodstock collection rate on the NOR population while providing a minimum number of returning adults to begin propagation of the new H_2 hatchery line while terminating the existing H_1 hatchery line as quickly as possible. Improvements in hatchery SARs from the recent average of 0.32% to estimates of 0.50% will greatly assist in the programs ability to expedite transition into the next phase. Both current and near future hatchery reform efforts are expected to bolster the SARs of the hatchery program Chinook. The recent changes to hatchery culturing practices (reduction in mini-jacks, reduced rearing densities) combined with a shift in release timing to a more normative spring period is hypothesized to improve outmigration survival and translate to improved SARs. Currently, spring Chinook smolts are released directly into the Klickitat River from the hatchery on or about March 1st. This timing is typically prior to any spring freshets in the Klickitat River, or commencement of spill schedules at Bonneville Dam beginning in mid April. We believe these factors substantially reduce outmigration survival. A SAR of 0.50% is a viable goal considering the SAR values recently observed in other neighboring Columbia Gorge spring Chinook programs (Table 2). In order to accommodate a shift in release timing, a reduction in release numbers will be necessary due to temporal space constraints of existing hatchery infrastructure. The projected total release number of yearlings will be temporarily reduced from 600,000 to 400,000-450,000 (100,000 N_1line and 300,000 to 350,000 H_1line). The broodstock collection and release numbers for phase I of the program transition are summarized in Tables 3 and 4.

Table 2. Estimated SARs for Columbia River spring Chinook hatchery programs. Values are presented in 2011 CSS Annual Report.

Brood Year	Klickitat	Carson NFH	LWS NFH	Warm Springs
1998	0.62%	2.85%		
1999	1.31%	1.49%		
2000	0.32%	1.01%		0.95%
2001	0.32%	0.23%		
2002	0.09%	0.62%		
2003	0.04%	0.30%		
2004	0.02%	0.42%		
2005	0.05%	0.54%		0.30%
2006	0.13%	1.48%	1.87%	0.84%
2007		1.47%	1.01%	0.63%
Mean	0.32%	1.04%	1.44%	0.68%

Phase II- Implement harvest augmentation hatchery stock conversion (H_2line)

Phase II will begin propagation of the new H_2 hatchery line while simultaneously terminating brood collection for the H_1 hatchery line. The founder stock to be used for the new H_2 hatchery line will consist of returning adults from the N_1 hatchery line. Collection of N_1 adults for the H_2 line will be triggered by the first year when sufficient numbers of adults return with all age classes present from the N_1line. Phase II will terminate the H_1line when N_1 returns are sufficient to maintain a release number equivalent to 300,000-350,000 smolts. Actual release numbers may vary during the transitional phase II due to adult return rates of the N_1line, and trapping efficiencies from combined efforts at the Lyly Falls adult trap and volunteer trap at the Klickitat hatchery. The initial size of the N_1 program was specifically designed to minimize the NOR broodstock collection rate while producing enough adults to maintain the reduced smolt release of 300-350,000 thus, allowing for a quick transition from the H_1 to H_2 hatchery line. Depending on adult return rates and trapping efficiencies of the Lyle adult trap, any surplus N_1line adults collected will be released into the natural habitat above Castile Falls to aid in the re-colonization process of the upper Basin. Further, the survival rates of the N_1 line and the status of NOR population will be continuously evaluated for possible, or necessary refinements to the number of NOR adults collected for the N_1 line. A summary of the implementation schedule, number of adults to be collected, and number of yearlings to be released are summarized in Tables 3and 4.

Phase III- Complete hatchery stock conversion, begin increasing total hatchery release numbers toward project's final release numbers.

The beginning of phase III should mark a point in time when H_1line adults are no longer returning to the basin, and increases in natural production should be readily observed. This phase of the program will begin increasing the number of hatchery releases toward the Master Plan's stated release goals. Information to be analyzed in the decision framework to initiate phase III will include a stock status review of the natural population, and performance (adult return rates) of N_1 and H_2 hatchery lines. Improved performance of the natural and hatchery populations may allow the program to transition from phase II to III based on the following:

- **Increased natural production of the NOR population-** This will allow for the option of the N_1line to increase production from 100,000 (68 adults) to 150,000 (102 adults) while keeping the NOR broodstock collection rate below 25%. A small proportion of NORs could also be included in the H_2line to help bolster PNI values of the composite population.
- **Improved Smolt-to-adult return rates of hatchery fish-** Additional N_1line adults may be available for broodstock if smolt-to-adult return rates meet or exceed 0.50%. Surplus N_1line adults released into the upper watershed during phase II of the program could also be re-prioritized for H_2line broodstock needs, thus eliminating the need to collect additional NORs.

Phase IV- Final increase of N_1 hatchery line and/or H_2 hatchery line release numbers to meet stated project objectives.

The final phase of the program will increase hatchery releases to the full extent as outlined in the Master Plan. Similar to phase III, information to be analyzed in the decision framework to initiate phase IV will include a stock status review of the natural population, and performance (adult return rates) of N_1 and H_2 hatchery lines. The following elements are necessary to achieve the project's long term conservation goals for a PNI 0.67:

- **Improved habitat conditions and survival-** A combination of seeded habitat in the upper basin, habitat restoration actions, and slight improvements in NOR smolt-to-adult survival rates may be required to increase NOR abundance for the Klickitat spring Chinook population.
- **Increased harvest of HORs-** A reduction in pHOS through harvest management practices will improve the PNI. In particular, increasing the harvest and reducing escapement of the H_2 hatchery line will have a greater positive effect on improving the PNI due to the small proportion of NORs used for this program, as opposed to the N_1line that uses 100% natural-origin broodstock.

Table 3. Broodstock collection schedule for Klickitat spring Chinook Integrated hatchery program. N_1line = NOR x NOR crosses; H_1line = current/historical hatchery stock; H_2line = New hatchery line consisting of F_1 hatchery adults (from N_1line) that may include some proportion of NORs in phase III and IV.

Program Phase	Broodstock Collection Schedule			
	Brood Year	# N_1 Line Brood	# H_1 Line Brood	# H_2 Line Brood
Phase I	**2013**	68	240	-
	2014	68	240	-
	2015	68	240	-
	2016	68	240	-
	2017	68	240	-
Phase II	**2018**	68	-	240
	2019	68		240
	2020	68		240
	2021	68		240
	2022	68		240
Phase III	**2023**	104		310
	2024	104		310
	2025	104		310
	2026	104		310
	2027	104		310
Phase IV	**2028**	138		411
	2029	138		411
	2030	138		411
	2031	138		411
	2032	138		411
	2033	138		411

Table 4. Juvenile release schedule for Klickitat spring Chinook Integrated hatchery program. N_1line = NOR x NOR crosses; H_1line = current/historical hatchery stock; H_2line = New hatchery line consisting of F_1 hatchery adults (from N_1line) that may include some proportion of NORs in phase III and IV.

Release year	# N_1 Line Releases	# H_1 Line Release	# H_2 Line Releases	Total Releases
2015	100,000	350,000		450,000
2016	100,000	350,000		450,000
2017	100,000	350,000		450,000
2018	100,000	350,000		450,000
2019	100,000	350,000		450,000
2020	100,000		300-350,000	400-450,000
2021	100,000		300-350,000	400-450,000
2022	100,000		300-350,000	400-450,000
2023	100,000		300-350,000	400-450,000
2024	100,000		300-350,000	400-450,000
2025	150,000		450-500,000	550-600,000
2026	150,000		450-500,000	550-600,000
2027	150,000		450-500,000	550-600,000
2028	150,000		450-500,000	550-600,000
2029	150,000		450-500,000	550-600,000
2030	200,000		600,000	800,000
2031	200,000		600,000	800,000
2032	200,000		600,000	800,000
2033	200,000		600,000	800,000
2034	200,000		600,000	800,000
2035	200,000		600,000	800,000

Table 5. Adult return schedule for Klickitat spring Chinook Integrated hatchery program. N_1line = NOR x NOR crosses; H_1line = current/historical hatchery stock; H_2line = New hatchery line consisting of F_1 hatchery adults (from N_1line) that may include some proportion of NORs in phase III and IV.

Adult Return Schedule			
Return Year	N_1Line Adults	H_1Line Adults	H_2Line Adults
2016	-		-
2017	-		-
2018			-
2019			-
2020			-
2021			-
2022			
2023		Terminated	
2024			
2025			
2026			
2027			
2028			
2029			
2030			
2031			
2032			
2033			
2034			
2035			