HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	Chiwawa River Spring Chinook Program
Species or Hatchery Stock	Upper Columbia River Spring Chinook (*Oncorhynchus tshawytscha*)
Agency/Operator	Washington Department of Fish and Wildlife
Watershed and Region	Wenatchee Subbasin/Columbia Cascade Province
Date Submitted	
Date Last Updated	August 29, 2005

Section 1: General Program Description

1.1 Name of hatchery or program.

Chiwawa River Spring Chinook Supplementation Program

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

Upper Columbia River Spring Chinook (*Oncorhynchus tshawytscha*)

ESA Status: Endangered

1.3 Responsible organization and individuals.

Name (and title):	Rick Stilwater
	Eastbank Hatchery Complex Manager
Agency or Tribe:	Washington Department of Fish & Wildlife
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program.

The Anadromous Fish Agreements and Habitat Conservation Plans (Mid-C. HCP) for Wells, Rocky Reach and Rock Island hydropower projects established a formal decision making body for the artificial production programs operated within the region and covered by the Mid-C. HCP. The decision making body, referred to as the Hatchery Committee, is composed of one (1) representative of each Party to include both Douglas and Chelan County PUD representatives (districts), the United States Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), the Washington Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), the Confederated Tribes of the Umatilla Indian Reservation (Umatilla) (collectively, the Joint Fisheries Parties or the JFP); and American Rivers, Inc., (American Rivers) a Washington D.C., nonprofit corporation.

The Hatchery Committee is tasked with oversight development of recommendations for implementation of the hatchery elements of the Mid-C. HCP. The Hatchery and Genetic Management Plans (HGMPs) are reflective of the decisions and implementation of actions as deemed appropriate and consistent with the Mid-C. HCP Hatchery Committee. Decisions and implementation actions made by the HCP Hatchery Committee will be dynamic and in the future, current DRAFT HGMPs would need to be updated during this on-going iterative process. Furthermore, the Hatchery Committee is responsible for determining program adjustments considering the methodology described in Biological Assessment and Management Plan (BAMP 1998) and providing recommended implementation plans to the District.

The districts are responsible for funding to include facility improvements, changes to artificial production programs, monitoring and evaluation of programs as identified in the Hatchery Compensation Plan, the Permit and the Agreement. The Districts or its designated agents shall operate the hatchery facilities according to the terms of the Section 8 "Hatchery Compensation Plan", the ESA Section 10 permit(s), and in consultation with the Hatchery Committee.

Co-operators	Role
Chelan PUD	Funding Source
Involved parties include those associated with the Rock Island Habitat Conservation Plan, Columbia River Fish Management Plan and the U.S. v. Oregon court decision	Program Coordination, Co-management, and Policy

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

Funding Sources
Chelan PUD

Operational Information	Number
Full time equivalent staff	18
Annual operating cost (dollars)	$2,596,000.00

Program is the funded by Public Utility District Number 1 of Chelan County for the purpose of mitigation for lost fish production associated with hydroelectric power system development in the region. Costs cannot be broken out for individual programs specifically from the total staff and operating budget at Eastbank Hatchery Complex.

1.5 Location(s) of hatchery and associated facilities.

Broodstock source	Chiwawa River
Broodstock collection location (stream, RKm, subbasin)	Chiwawa River/RKm 2.0/Wenatchee and Tumwater Dam (Wenatchee River) RKm 52.0/Wenatchee
Adult holding location (stream, RKm, subbasin)	Eastbank Hatchery/Columbia River/~RKm 790/Upper-Mid Columbia
Spawning location (stream, RKm, subbasin)	Eastbank Hatchery/Columbia River/~RKm 790/Upper-Mid Columbia
Incubation location (facility name, stream, RKm, subbasin)	Eastbank Hatchery/Columbia River/~RKm 790/Upper-Mid Columbia
Rearing location (facility name, stream, RKm, subbasin)	Eastbank Hatchery/Columbia River/~RKm 790/Upper-Mid Columbia Chiwawa Rearing Ponds/Chiwawa River/Rkm 2.0/Wenatchee

1.6 Type of program.

Integrated Recovery Program

1.7 Purpose (Goal) of program.

Recovery of ESA listed species by increasing the abundance of the natural adult population in the Chiwawa River, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity. Since the program was initiated in 1989, the stock has been listed as endangered and has under gone a precipitous decline in abundance.

1.8 Justification for the program.

Artificial propagation programs exist to mitigate for lost spring Chinook resulting from operation of Wells Dam, Rocky Reach Dam and Rock Island Dam. The mitigation programs are components of long-term Habitat Conservation Plan (HCP) agreements associated with the hydro- electric projects. The ESA allows for "the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures pursuant to the Act are no longer necessary" (ESA 1973). Consistent with the provision, WDFW and the parties to the Mid-Columbia (MC) HCPs are implementing supplementation and captive broodstock programs to sustain and recover the listed population using indigenous broodstock.

NOAA Fisheries concluded that the Upper Columbia River spring chinook salmon (*Oncorhynchus tshawytscha*) population is currently at risk of extinction (Myers et al. 1998) and warrants listing under the ESA as "endangered". Populations in this ESU have experienced record low adult returns of naturally produced spring chinook since hatchery programs were initiated. All remaining populations have experienced years with fewer than 150 spawners, and at least 6 historical populations in the ESU have been extirpated. Short-term abundance trends for remaining populations are downward, with the majority exhibiting rates of decline in some years exceeding 20 % per year. Hydroelectric development of the mainstem Columbia River has resulted in a major disruption of migration corridors, and affected flow regimes and estuarine habitat. In particular, the construction of Chief Joseph and Grand Coulee Dams prevented thousands of Upper Columbia River-origin spring chinook from reaching their natal streams. Remaining populations in this ESU must traverse at least seven mainstem dams during downstream and upstream migration; Methow populations must migrate through nine mainstem dams. Mortalities occurring at the mainstem Columbia River Dams are considered a primary man-caused limiter to spring chinook production (WDFW et al. 1993). Local habitat problems related to irrigation diversions, hydroelectric development, urbanization, and livestock grazing also limit the productivity of naturally-produced spring chinook in the region.

Historically, artificial propagation efforts have also had a significant impact on spring-run populations, either through hatchery-based enhancement or the extensive trapping and transportation activities associated with the Grand Coulee Fish Maintenance Project (GCFMP). Because spring-run chinook salmon populations were at severely depressed levels at the time of the GCFMP, naturally spawning populations in this ESU were founded by the same GCFMP homogenized stock. The current impact of WDFW hatchery-origin fish on naturally spawning populations is unknown. However, a comprehensive monitoring and evaluation program is under development and designed to quantify effects fromt he hatchery program. In addition, a DNA pedigree study is currently ongoing, specifically designed to measure the relative reproductive success of the Chiwawa hatchery and naturally produced spring Chinook. Artificial propagation efforts now focus on supplementing naturally spawning populations, and on the production of captive brood fish for stock preservation purposes.

Given existing conditions, and the likelihood that habitat-related factors adversely affecting spring chinook productivity in the Basin will not be remedied in the near future, artificial propagation will continue to be necessary to prevent extinction of this ESU. These circumstances have led WDFW, NMFS, and the other parties to the Mid-Columbia Habitat Conservation Plan (MCHCP) to conclude that

artificial propagation activities, including hatchery supplementation and captive broodstock programs, are essential for the conservation and recovery of spring chinook salmon in the Mid-Columbia Region (BAMP 1998).

WDFW operates two hatchery complexes within the upper Columbia River (UCR) Basin for the propagation of spring chinook salmon: the Methow Fish Hatchery Complex and the Rock Island Fish Hatchery Complex. These complexes are funded by the Public Utility Districts in the UCR region to mitigate the impacts of the hydropower dams on the mainstem Columbia River. The Public Utility District No. 1 of Chelan County (Chelan PUD) funds the operation of the Rock Island Fish Hatchery Complex, and the Public Utility District No. 1 of Douglas County (Douglas PUD) funds the operation of the Methow Fish Hatchery Complex. The Methow Complex uses returning spring chinook salmon adults collected at weirs on the Methow River and its tributaries, the Twisp and Chewuch Rivers. More recently, up-river-bound spring chinook salmon adults have been collected at Wells Dam. The adult spring chinook salmon program at the U.S. Fish and Wildlife Service (USFWS) Winthrop National Fish Hatchery (NFH) (Permit 1300) coordinates broodstock collection and rearing activities with the Methow Complex in the Methow River Basin. The Rock Island Complex uses spring chinook salmon broodstock collected at a weir on the Chiwawa River, a tributary of the Wenatchee River, and at Tumwater Dam on the Wenatchee River. WDFW's Eastbank Hatchery is part of the Rock Island Complex.

Section 10 (a)(1)(A) Permit For Takes Of Endangered/Threatened Species, Permit # - 1196, Expiration Date: January 20, 2014.

The Washington Department of Fish and Wildlife (WDFW), the Public Utility District No.1 Chelan County (Chelan PUD), and the Public Utility District No.1 of Douglas County (Douglas PUD), is authorized to take endangered upper Columbia River (UCR) spring chinook salmon (*Oncorhynchus tshawytscha*) and endangered UCR steelhead (*Oncorhynchus mykiss*) for scientific research/enhancement purposes. The permit is based on three Habitat Conservation Plans (HCPs):; *Anadromous Fish Agreement and Habitat Conservation Plan, Wells Hydroelectric Project FERC1 License No. 2149* with Douglas PUD for the operation of Wells Dam (DPUD 2002), and *Anadromous Fish Agreement and Habitat Conservation Plan Rocky Reach Hydroelectric Project FERC License No. 2145* (CPUD 2002a) with Chelan PUD for the operation of Rocky Reach Dam, and *Anadromous Fish Agreement and Habitat Conservation Plan Rock Island Hydroelectric Project FERC License No. 943* with Chelan PUD for the operation of Rock Island Dam (CPUD 2002b), and subject to the provisions and conditions of Section 10(a)(1)(A) of the Endangered Species Act of 1973 (ESA) (16 U.S.C. §§ 1531-1543), the National Marine Fisheries Service (NOAA Fisheries) regulations governing ESA-listed species permits (50 CFR Parts 222-226). Biological Opinions with incidental take statements (ITSs) on the operation of each of the above hydroprojects have been issued consistent with the HCPs (NMFS 2003a, 2003b, 2003c). The amended permit #1196 adds Chelan and Douglas PUDs to the permit as joint permit holders with WDFW in accordance with the three Habitat Conservation Plan (HCP) agreements reached between the PUDs, NOAA Fisheries, USFWS,the Confederated Tribes of the Colville Reservation, and the Yakama Nation. WDFW is authorized an annual take of adult and juvenile, endangered, naturally-produced and artificially-propagated, Upper Columbia River spring Chinook (UCR) associated with hatchery supplementation for the Wenatchee River Basin population of spring chinook and hatchery supplementation program that includes a "phased-out" Twisp River captive brood program for the Methow River Population of the species (Permit # - 1196 Permit Type- Scientific Research/Enhancement). The program intent is to supplement the species' naturally spawning population in the two watersheds. WDFW's supplementation program includes the collection of ESA-listed adults for broodstock, the utilization of artificial propagation in the hatchery environment (including Twisp River eyed-eggs received from AquaSeed and Nason Creek pre-smolt/smolts received from AquaSeed), rearing of artificially spawned progeny in the hatchery and the release of artificially propagated juveniles into respective streams of origin.

I. Supplementation activities as conditioned by Section 10 Permit # - 1196 include:

- Collection of broodstock through trap operations on the Twisp River, Chewuck River, at Foghorn Dam on the Methow River, and at Methow Hatchery for the Methow River populations (with potential collections at Wells Dam), and on the Chiwawa River and Nason Creek or Tumwater Dam for Wenatchee River Basin-origin spring chinook salmon;
- Transfer of adults and fertilized eggs between the Methow Hatchery and the Winthrop NFH; holding and artificial spawning of collected adults at the Methow and Eastbank Hatcheries;
- Incubation and propagation from the fertilized egg through the smolt life stage at Methow and Eastbank Hatcheries;
- Holding and artificial spawning of collected adults at the Methow and Eastbank Hatcheries;
- Transfer of fingerlings and pre-smolts from the two hatcheries for rearing in acclimation ponds on the Chiwawa, Twisp, and Chewuch Rivers; and the release of smolts into the Methow, Chewuch, Twisp, and Chiwawa Rivers from the WDFW hatcheries and acclimation ponds on those systems.
- Release of smolts into the Methow, Chewuch, Twisp, and Chiwawa Rivers from the hatcheries and acclimation ponds in those systems;
- Monitoring of the programs in the hatchery environment using standard techniques such as growth and health sampling;
- Monitoring of the programs in the natural environment using standard techniques such as juvenile fish traps and adult spawner surveys.

II. Annual reports as conditioned by Section 10 Permit # - 1196:

The scope of detail on broodstock trapping, identity, incubation, rearing, marking and releases from this program are included in annual reports as submitted by WDFW and conditioned by Section 10 Permit # - 1196 covering the period from January 1- December 31 each year per permit (Reporting and Annual Authorization Requirements; Section C.1-C.9). Specifically, the annual reports include detailed activities as per requirements:

- A detailed description of activities conducted under this permit, including the total number of fish taken at each location, the number of ESA-listed fish taken at each location, the manner of take, and the dates/location of the take;
- Measures taken to minimize disturbances to ESA-listed fish and the effectiveness of these measures, the condition of ESA- listed fish taken and used for research/enhancement activities, a description of the effects of research/enhancement activities on the subject species, the disposition of ESA-listed fish in the event of mortality and a brief narrative of the circumstances surrounding ESA-listed fish injuries or mortalities;
- A detailed description of spawning activities;
- A detailed description of all tagging/marking used to segregate production groups;
- Any problems that may have arisen during research/enhancement activities, and a statement as the whether or not the research/enhancement activities has unforeseen effects;
- A summary of all mortality patterns of ESA- listed fish in the hatchery;
- A summary documenting the monitoring and evaluation activities associated with endangered UCR spring chinook hatchery supplementation program. Such monitoring and evaluation efforts shall include the relative success of juvenile rearing procedures and techniques, a description of any substantial mortality events in the hatcheries, CWT recoveries and analysis, an evaluation of relative success of hatchery x natural and natural x natural crosses and an evaluation of release strategies.

- Steps that have been and will be taken to coordinate the research with that of other researchers;
- The purpose, linage, number and location of all educational, Tribal, or public outreach displayed or received ESA- listed fish produced from WDFW's program.

III. Operation of WDFW Facilities and Practices:

WDFW proposes to implement the following measures into the propagation program operation to minimize potential negative impacts on ESA-listed species:

- Water rights are formalized thru trust water rights from the Department of Ecology. Monitoring and measurement of water usage is reported in monthly NPDES reports.
- *National Pollutant Discharge Elimination System Permit Requirements*. This facility operates under the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) administered by the Washington Department of Ecology (DOE). 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. Conduct routine water monitoring to ensure that the levels of total suspended solids, settleable solids, and water temperature at each facility to remain compliant with NPDES permits issued by Washington Department of Ecology.
- *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).
- Conduct routine, generally monthly, fish growth monitoring during rearing at each facility;
- Dispose of juvenile and adult carcasses via the local solid waste management system, on-station burial, or distributing carcasses into the river system of origin for nutrient enhancement after appropriate fish health certification. WDFW proposes to implement the following measures into the propagation program operation to minimize potential negative impacts on ESA-listed species.
- *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).
- *Spawning Guidelines for Washington Department of Fisheries Hatcheries*. Assembled to complement the above genetics manual, these guidelines define spawning criteria to be use to maintain genetic variability within the hatchery populations. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 7, IHOT 1995).
- *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).

1.9 List of program "Performance Standards".

See Section 1.10.

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

"Performance Indicators" determine the degree that program standards have been achieved, and indicate the specific parameters to be monitored and evaluated. Adequate monitoring and evaluation must exist to detect and evaluate the success of the hatchery program and any risks to or impairment of recovery of affected, listed fish populations.

The NPPC "Artificial Production Review" document presents a list of draft "Performance Indicators" that, when linked with the appropriate performance standard, stand as examples of indicators that could be applied for the hatchery program. If an ESU-wide hatchery plan is available, use the performance indicator list already compiled. Essential 'Performance Indicators" that should be included are monitoring and evaluation of overall fishery contribution and survival rates, stray rates, and divergence of hatchery fish morphological and behavioral characteristics from natural populations.

The list of "Performance Indicators" should be separated into two categories: "benefits" that the hatchery program will provide to the listed species, or in meeting harvest objectives while protecting listed species; and "risks" to listed fish that may be posed by the hatchery program, including indicators that respond to uncertainties regarding program effects associated with a lack of data.

1.10.1) "Performance Indicators" addressing benefits.

(e.g. "Evaluate smolt-to-adult return rates for program fish to harvest, hatchery broodstock, and natural spawning.").

1.10.1 Benefits:

Listed below are the Monitoring and Evaluation Program indicators and objectives developed for the Chiwawa spring Chinook programs by the HCP Hatchery Committee (HC).

Performance Standards	Performance Indicators	Monitoring and Evaluation
1.Increase the number of naturally spawning and naturally produced adults of the target population relative to a non-supplemented population and the changes in the natural replacement rate (NRR) of the supplemented population (reference population) is similar to that of the non-supplemented population.	Natural Replacement Rate (NRR). Ho: Δ Total spawners $_{\text{Supplemented population}} > \Delta$ Total spawners $_{\text{Non-supplemented population}}$ Ho: Δ NOR $_{\text{Supplemented population}} \geq \Delta$ NOR $_{\text{Non-supplemented population}}$ Ho: Δ NRR $_{\text{Supplemented population}} \geq \Delta$ NRR $_{\text{Non-supplemented population}}$	Spawning escapement and spawning origin composition of supplemented and non-supplemented (reference) populations.
2. Maintain run timing, spawn timing, and spawning distribution of endemic populations.	Ho: Migration timing $_{\text{Hatchery}}$ = Migration timing $_{\text{Naturally produced}}$ Ho: Spawn timing $_{\text{Hatchery}}$ = Spawn timing $_{\text{Naturally produced}}$ Ho: Redd distribution $_{\text{Hatchery}}$ = Redd distribution $_{\text{Naturally produced}}$	Monitor and evaluated supplemented and non supplemented (reference) population run-timing, spawn timing and redd distribution.
3. Maintain endemic population genetic diversity, population structure, and effective population size Additionally, determine if hatchery programs have caused changes in phenotypic characteristics of natural populations.	Ho: Allele frequency $_{\text{Hatchery}}$ = Allele frequency $_{\text{Naturally produced}}$ = Allele frequency $_{\text{Donor pop.}}$ Ho: Genetic distance between subpopulations $_{\text{Year x}}$ = Genetic distance between subpopulations $_{\text{Year y}}$ Ho: Δ Spawning Population = Δ Effective Spawning Population Ho: Age at Maturity $_{\text{Hatchery}}$ = Age at Maturity $_{\text{Naturally produced}}$ Ho: Size at Maturity $_{\text{Hatchery}}$ = Size at Maturity $_{\text{Naturally produced}}$	Periodic (each 5 years) genetic analysis of hatchery and naturally adult and juvenile fish in the supplemented population and natural origin fish in the non-supplemented population. Monitor and evaluate run timing, spawn timing, redd distribution, size and age at maturity, and effective population size of supplemented and non-supplemented populations.

4. Achieve/maintain adult-to-adult survival (i.e., hatchery replacement rate) that is greater than the natural adult-to-adult survival (i.e., natural replacement rate) and equal to or greater than the program specific HRR expected value based on survival rates listed in the BAMP (1998).	Ho: $HRR_{Year\ x} > NRR_{Year\ x}$ Ho: HRR ≥ Expected value per assumptions in BAMP	Monitor and evaluate hatchery and natural adult-to-adult replacement rate in the supplemented populations.
5. Maintain the stray rate of hatchery fish below the acceptable levels to maintain genetic variation between stocks.	Ho: Stray rate $_{Hatchery\ fish}$ < 5% of total brood return Ho: Stray hatchery fish < 5% of spawning escapement of other independent populations. Ho: Stray hatchery fish < 10% of spawning escapement of any non-target streams within independent population.	Monitor and evaluate hatchery stray rates and proportional contribution to natural spawning aggregates.
6. Provide release of hatchery fish consistent with programmed size and number.	Ho: Hatchery fish $_{Size}$ = Programmed $_{Size}$ Ho: Hatchery fish $_{Number}$ = + 10% of Programmed $_{Number}$	Monitor fish size and number at release.
7. Maintain the proportion of hatchery fish on the spawning grounds at a levels that minimize negative affects to freshwater productivity (i.e., number of smolts per redd) of supplemented streams when compared to non-supplemented streams with similar adult seeding levels.	Ho: Δ smolts/redd $_{Supplemented\ population}$ > Δ smolts/redd $_{Non\text{-}supplemented\ population.}$	Monitor and evaluate annual smolt production in supplemented and non-supplemented populations. Monitor and evaluate redd deposition in supplemented and non-supplemented populations.
8. Provide no significant increase in incidence of BKD in the natural and hatchery populations.	Ho: Conc. $_{BKD}$ supplemented fish $_{Time\ x}$ = Conc. $_{BKD}$ supplemented fish $_{Time\ x}$ Ho: Conc. $_{BKD}$ supplemented stream $_{Time\ x}$ = Conc. $_{BKD}$ non-supplemented stream $_{Time\ x}$ Ho: Conc. $_{BKD}$ hatchery effluent $_{Time\ x}$ = Conc. $_{BKD}$ hatchery effluent $_{Time\ x}$ Ho: Conc. $_{BKD}$ supplemented stream $_{Upstream\ Time\ x}$ = Conc. $_{BKD}$ hatchery effluent $_{Time\ x}$ = Conc. $_{BKD}$ supplemented stream $_{Downstream\ Time\ x}$ Ho: Hatchery disease $_{Year\ x}$ = Hatchery disease $_{Year\ y}$	Perform diagnostic disease investigations in the hatchery population and natural population, in supplemented and non-supplemented streams.
9. Minimize adverse impacts to non-target taxa of concern (NTTOC).	Ho: NTTOC abundance $_{Year\ x\ through\ y}$ = NTTOC abundance $_{Year\ y\ through\ z}$ Ho: NTTOC distribution $_{Year\ x\ through\ y}$ = NTTOC distribution $_{Year\ y\ through\ z}$ Ho: NTTOC size $_{Year\ x\ through\ y}$ = NTTOC size $_{Year\ y\ through\ z}$	

1.10.2 Risks

Performance Standards	Performance Indicators	Monitoring and Evaluation
1. Artificial propagation activities comply with ESA responsibilities to minimize impacts and/or interactions to ESA listed fish	Project complies with Section 10 permit conditions including juveniles are raised to smolt-size (12 fish/lb) and released from the hatchery at a time that fosters rapid migration downstream. 100% mass mark and CWT fish to identify them from naturally produced fish.	As identified in the HGMP: Monitor size, number, date of release and mass mark quality. Additional WDFW projects: straying, instream evaluations of juvenile and adult behaviors, NOR/HOR ratio on the spawning grounds, fish health documented. Required data are generated through the M & E plan and provided to NOAA Fisheries as required per annual report compliance.
2. Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring.	All facilities meet WDFW water right permit compliance and National Pollution Discharge Elimination System (NPDES) requirements (NPDES permit #WAG-5011).	Flow and discharge reported in monthly NPDES reports. Environmental monitoring of total suspended solids, settle-able solids, in-hatchery water temperatures, in-hatchery dissolved oxygen, nitrogen, ammonia, and pH will be conducted and reported as per permit conditions.
3. Water intake systems minimize impacts to listed wild salmonids and their habitats.	Water withdrawal – permits will be obtained to establish water rights for each hatchery facility. Intake screens – designed and operated to assure approach velocities and operating conditions provide protection to wild salmonid species.	Intake system designed to deliver permitted flows. Operators monitor and report as required Hatcheries participating in the programs will maintain all screens associated with water intakes in surface water areas to prevent impingement, injury, or mortality to listed salmonids.
4. Hatchery operations comply with all ESA permit requirements.	Section 10 annual reports are submitted in compliance with permits.	Section 10 annual reports are submitted in compliance with permits.
5. 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 WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed
6. The risk of catastrophic fish loss due to hatchery facility or operation failure is minimized.	Staffing allows for rapid response for protection of fish from risk sources (water loss, power loss, etc.). Backup generators to provide an alternative source of power to supply water during power outages. Protocols in place to test standby generator and all alarm systems on a routine basis. Multiple rearing sites or footprints for captive broodstock rearing. Alarm systems installed and operating at each rearing vessel to detect loss of or reduced flow and reduced operating head in rearing vessels. Densities at minimum to reduce risk of loss to disease. Sanitation – all equipment is disinfected between uses on different	Hatchery engineering design and construction accommodate security measures. Operational funding accommodates security measures. Training in proper fish handling, rearing, and biological sampling for all staff. Staff are trained to respond to alarms and operate all emergency equipment on station. Maintenance is conducted as per manufacturer's requirements and according to hatchery maintenance schedules.

	lots of fish including nets, crowders, boots, raingear, etc.	
6. Broodstock collection and juvenile hatchery releases minimize ecological effects on listed wild fish.	Hatchery spring chinook reared to sufficient size such that smoltification occurs within nearly the entire population, reducing residence time in streams after release (CV length ≤ 10%, condition factor 0.9 – 1.0). 2. Smolts acclimated and imprinted on surface water from the natal steam to enhance smoltification and reduce residence time in the tributaries and mainstem migration corridors. All spring chinook encountered in hatchery broodstock collection operations will be held for a minimal duration in the traps; generally less than 24 hrs and follow permit protocols. Spring chinook trapped in excess of broodstock collection goals will be released upstream or returned to natal streams immediately. Hatchery spring chinook reared to sufficient size such that smoltification occurs within nearly the entire population, reducing residence time in streams after release (CV length ≤ 10%, condition factor 0.9 – 1.0). Smolts acclimated and imprinted on surface water from the natal steam to enhance smoltification and reduce residence time in the tributaries and mainstem migration corridors.	Fish culture and evaluation staff monitor behavior, coefficient of variation in length, and condition. Fish health specialists will certify all hatchery fish before release. Up to three downstream juvenile smolt traps will be used to monitor the outmigration of hatchery and wild fish. Outmigration may also be monitored through PIT tag detection systems at mainstem passage facilities. Broodstock collection protocols will developed each season and reviewed by the HCP Hatchery committees.

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

Broodstock collection levels are capped by the combined total number of naturally produced spring chinook adults and jacks that return to the Chiwawa River and Nason Creek where WDFW can retain up to 400 or 33% of the naturally produced run, whichever is less. Furthermore, the broodstock must also comprise no less than 33% naturally produced fish.

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

Levels of up to 672,000 juvenile, endangered, artificially propagated UCR spring chinook progeny can be generated from the supplementation program based upon meeting broodstock collection objectives. The release levels may be adjusted downward by the HCP Hatchery Committees to meet specific program objectives on an annual basis. Fish are reared to a yearling stage (12 fish/lb), acclimated, and released from Chiwawa River Ponds located at RKm 2.0 of the Chiwawa River confluence with the Wenatchee River.

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

Table 1. SARs and Spawner recruit (from APRE database).

Brood Year	HoRs		Combined (HoRs + NoRs)	
	Smolt to Adult Survival (%)	Recruits per Spawner	Smolt to Adult Survival (%)	Recruits per Spawner
1990	0.04	1.05	M	0.097
1991	0.06	1.06	M	0.085
1992	0.04	0.29	0.051	0.056
1993	0.13	2.70	0.541	0.585
1994	0.07	1.33	0.128	0.219
1995	NA	NA	0.739	1.37
1996	0.57	4.78	0.959	0.219
1997	0.95	NA	NA	NA
1998	NA	NA	NA	NA
1999	NA	NA	NA	NA

Table 2: Adult (Age 4+) Spawner to Spawner return estimates for upper Columbia Spring Chinook Stocks. Detailed run reconstructions are provided in Appendix A. Return levels for brood years marked with asterisks (1960-69) adjusted to reflect recent historical average harvest rates, number of mainstem dams. Returns from 1994 brood escapements include components based on jack returns. Table from the Upper Columbia River Steelhead and Spring Chinook Salmon Quantitative Analysis Report, *Final Draft: Sept. 25, 2002* Run Reconstructions and Preliminary Assessment of Extinction Risks. Upper Columbia Quantitative Assessment Report Analytical Requirements Committee Publication.

Brood Year	Wenatchee Spring Chinook			Entiat Spring Chinook			Methow Spring Chinook		
	Spwrs	Return	R/S	Spwrs	Return	R/S	Spwrs	Return	R/S
*60	2,057	2,535	1.23	316	815	2.58	2,006	2,740	1.37
*61	1,428	4,060	2.84	127	428	3.36	616	2,396	3.89
*62	2,685	4,652	1.73	315	772	2.45	2,472	3,423	1.38
*63	1,114	3,645	3.27	269	660	2.46	1,245	1,978	1.59
*64	2,538	3,821	1.51	1,096	589	0.54	3,845	1,551	0.40
*65	2,526	2,990	1.18	232	323	1.39	1,115	1,405	1.26
*66	5,836	1,866	0.32	831	236	0.28	4,280	1,417	0.33
*67	3,283	1,933	0.59	648	293	0.45	2,163	1,384	0.64
*68	4,064	3,821	0.94	685	330	0.48	1,707	1,805	1.06
*69	3,730	3,673	0.98	391	516	1.32	1,323	1,752	1.32
*70	2,530	2,677	1.06	182	330	1.81	1,525	1,496	0.98
71	1,302	2,675	2.05	348	335	0.96	1,258	1,340	1.07
72	2,657	2,113	0.80	182	218	1.20	1,569	978	0.62
73	5,225	3,114	0.60	636	667	1.05	2,152	2,120	0.99
74	1,939	2,442	1.26	267	756	2.83	1,163	1,684	1.45
75	3,548	1,169	0.33	458	254	0.55	1,987	390	0.20
76	1,692	1,438	0.85	81	292	3.61	390	330	0.84
77	2,648	2,238	0.85	501	297	0.59	1,841	363	0.20
78	3,733	2,559	0.69	1,009	322	0.32	2,541	488	0.19
79	1,009	1,333	1.32	233	300	1.28	462	458	0.99
80	1,414	2,898	2.05	295	233	0.79	348	1,029	2.96
81	1,561	3,919	2.51	285	381	1.34	442	683	1.54
82	1,744	2,753	1.58	322	291	0.90	528	1,335	2.53
83	3,158	1,639	0.52	324	273	0.84	818	1,175	1.44
84	2,211	1,049	0.47	250	62	0.25	868	1,124	1.29
85	4,408	1,300	0.29	351	222	0.63	1,204	1,039	0.86
86	2,614	655	0.25	321	165	0.52	891	677	0.76
87	1,834	616	0.34	194	104	0.54	1,449	711	0.49
88	1,656	1,112	0.67	201	265	1.31	1,588	2,004	1.26
89	1,306	641	0.49	112	170	1.51	1,086	708	0.65
90	913	25	0.03	254	43	0.17	1,089	49	0.05
91	521	102	0.19	93	22	0.24	481	56	0.12
92	1,063	197	0.18	129	35	0.27	1,598	140	0.09
93	1,177	205	0.17	311	54	0.17	1,344	161	0.12
94	270	***198***	***0.73***	73	**85**	**1.16**	276	**116**	**0.42**

Table 3. Adult Returns to the Wenatchee Basin counted at Tumwater Dam (1999 – 2004). WDFW UCR database (A. Murdoch).

Return Year	Adult Returns	Return Year	Adult Returns
		1999	198
		2000	830
		2001	6268
		2002	2265
		2003	1342
		2004	1968

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

The program was initiated in 1989. The UCR spring chinook salmon ESU was listed as endangered on March 24, 1999 (NMFS 1999) with supplementation activities as conditioned by Section 10 permit #1196 starting with 2000 brood year.

1.14 Expected duration of program.

NMFS proposed to extend the duration of the permit 1196 from five years to ten years (2014). The three HCP agreements were developed to be in effect for 50 years from the time of incorporation into the FERC licenses for each hydropower facility. The artificial propagation programs are intended to mitigate for inundation and unavoidable dam passages losses during the operation of the hydropower facilities. These agreements are intended to provide some level of certainty for the PUDs and other stakeholders. To that end, the HCP agreements stipulate that the artificial propagation production level will remain constant for 10 years with defined program review schedules at five years into the agreement and the expiration of the permit.

1.15 Watersheds targeted by program.

Wenatchee Subbasin/Columbia Cascade Province

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

CHIWAWA SPRING CHINOOK OVERVIEW

The program level for the Chiwawa spring chinook is currently 672,000 yearling smolts. The program goal is to increase the abundance of the naturally spawning population while maintaining genetic integrity, appropriate spawner distribution, and long-term productivity of the stock. Since the program was initiated in 1989, the stock has been listed as endangered and has under gone a precipitous decline in abundance. Failure to meet the program level release of smolts has been problematic. Broodstock are collected from a weir located on the Chiwawa River, although some hatchery fish have been collected at Tumwater Dam. The efficacy of the weir to collect broodstock under moderate to high river flows has been identified as a potential problem, although, the mean extraction rate for the weir has been 18% (range 5-40%). In most years, the limiting factor to production has been the low abundance of wild fish.

Juveniles are initially reared at Eastbank FH and transferred to an acclimation pond on the Chiwawa River in the fall. Fish are reared on Chiwawa River water until water temperatures decline and frazil ice becomes a problem. At which time, the pond water source is switched to Wenatchee River water until the spring. The pond water source is switched back to Chiwawa River after water temperatures have increased and frazil ice is not a problem. While at Chiwawa Ponds fish are typically reared for 7 months (Sep- April) of which only 3-4 months are on Chiwawa River water. As a result, 27% of the returning adults have strayed into streams other than the Chiwawa River. High stray rates from this program have been identified as a critical problem.

POTENTIAL ALTERNATIVES

Alternative 1. The identified maximum extraction rate (33%) may be achieved if the broodstock collection protocol was modified to allow the Chiwawa weir to be operated seven days per week. However, if program release levels were met (672,000) without correcting the stray problem a substantial number of fish would stray to all tributaries of the Wenatchee River. The risk from a reduction in genetic variability would be great. Maintaining the genetic uniqueness of the White River population would be impossible. The stray rate of the Chiwawa Spring chinook program must be reduced to acceptable levels (i.e., <5%).

Alternative 2. Collecting adults at Tumwater Dam would require a molecular marker that has yet to be identified. The number of fish collected for broodstock would be increased because all fish must migrate through the fish ladder. This methodology would require impact all spring chinook stocks upstream of Tumwater Dam.

If a marker is identified unique to the Chiwawa River stock, logistical considerations related to holding fish, and subsequent handling stress if a fish is not determined to be the target stock need to be adequately addressed. Escapement to the Chiwawa River is on average 50% of the total escapement above Tumwater Dam. In order to meet the broodstock goal, twice the required number of fish would be have to be collected. If samples could be analyzed in a timely manner, non-target fish could be transported and released back into the Wenatchee River before spawning had begun.

Alternative 3 (WDFW supported)

The broodstock required to releases 672,000 smolts can not be collected given the current stock abundance and broodstock guidelines (minimum 33% wild fish, not to exceed 33% of the total run). Reevaluate the program release numbers based on desired broodstock composition and run size and shift the remaining production to an alternate program.

Implement changes immediately to reduce the stray rates of Chiwawa spring chinook. Redesign the water intakes on Chiwawa River and Wenatchee River to incorporate mixing of the two sources and well water. Wenatchee River water should be used only as a stopgap means of preventing catastrophic loss due to ice (e.g. days not months).

Reducing the program release level would not require further modifications of the Chiwawa weir. Although considerable cost would be attributed to the development of a new program to meet mitigation requirements (e.g., Nason Creek) provided an existing hatchery program could not be identified (e.g., Leavenworth spring chinook).

Reducing the stray rate of the Chiwawa program would minimize associated genetic risks, while increasing the escapement to the Chiwawa River. Higher escapement levels would contribute to a subsequent increase in the naturally spawning population.

POTENTIAL REFORMS AND INVESTMENT

Collecting spring chinook at Tumwater Dam would require the identification of a molecular marker. Substantial analyses would be required of existing genetic tissue samples from all tributary populations. If a neutral genetic marker was to be identified it would eliminate the need to operate Chiwawa weir and increase the probability of obtaining the required number of broodstock to meet mitigation goals.

An additional adult holding pond at Eastbank FH would be required to accommodate the increased number of spring chinook that would need to be collected. Additional cost would include analysis of the tissue samples to identify Chiwawa spring chinook.

COST ESTIMATE - Identification of genetic marker – unknown. DNA analysis of broodstock 379 x 2 = 758 fish @ $35/sample = $26,530/year

The success of the Chiwawa Spring Chinook program depends on the ability of returning adults to spawn in the Chiwawa River. High stray rates pose an unacceptable risk to other endangered stocks in the Wenatchee river basin (i.e., White River). Modification of the water intakes and ponds to include incorporating well water would be required. Increasing the homing ability of these fish is critical for the success of the supplementation program.

Section 2: Program Effects on ESA-Listed Salmonid Populations

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

WDFW has the following permits for hatchery operations in the Upper and Mid-Columbia:

Section 10(a)(1)(B) Permit Number 1196 Permit Type: Scientific Research/Enhancement-Artificial production of upper Columbia spring chinook. Expires Dec 31, 2007 but was amended on January 20, 2004 and expires January 20, 2014. Activities described in the application for this permit have been authorized under terms and conditions of the Biological Opinion on Artificial Propagation in the Columbia River Basin (NMFS 1999). WDFW submits annual reports as conditioned by Section 10 permit # 1196 covering the period from January 1- December 31 each year. Broodstock retained may be used in the USFWS's Winthrop NFH Methow River Basin supplementation programs. Methow Fish Hatchery Complex activities are coordinated with the U.S. Fish and Wildlife Service (USFWS) spring chinook artificial supplementation program at the Winthrop NFH (ESA Section 10 Permit #1300).

Section 10(a)(1)(B) Permit Number: 1395 Permit Type: Direct Take (artificial propagation of listed steelhead) authorizes the WDFW, the Chelan PUD, and the Douglas PUD annual take of ESA listed adult and juvenile, endangered, naturally produced and artificially propagated, UCR steelhead and UCR spring chinook salmon associated with the implementation of UCR steelhead artificial propagation enhancement programs in the UCR region. The programs are intended to supplement naturally spawning UCR steelhead production occurring upstream from Priest Rapids Dam on the mainstem Columbia River, including the Wenatchee, Methow, and Okanogan Rivers, and their tributaries. Expires October 2, 2013.

Section 10(a)(1)(B) Permit Number 1347 Permit Type: Incidental take of upper Columbia spring chinook and steelhead resulting from the propagation of unlisted sockeye, summer and fall chinook at Eastbank, Wells, Priest Rapids, Lake Wenatchee sockeye, and cooperative releases. Expires October 22, 2013.

Section 10(a)(1)(B) Permit Number: **1248 Permit Type:** Incidental take of ESA-listed anadromous fish species associated with seven recreational fishery programs to be conducted above Priest Rapids Dam on the Columbia River. This permit expired at the end of 2004 and is being renewed to include all fisheries above the Highway 395 Bridge in Pasco. This permit was submitted to NOAA for a renewal March 16, 2005 and is awaiting approval.

Section 10(a)(1)(B) Permit Number: 1482 (1203) Authorizes the take of ESA-listed upper Columbia River salmon and steelhead associated with research activities in the upper Columbia River Basin. This permit was modified in 2004 and the issue date is pending NOAA approval.

Authorizations

FERC processes:
Under current settlement agreements and stipulations, the three mid-Columbia PUDs pay for the operation of hatchery programs within the Columbia Cascade Province. These programs determine the levels of hatchery production needed to mitigate for the construction and continued operation of the PUD dams.

Habitat Conservation Plans:
In 2002, habitat conservation plans (HCPs) were signed by Douglas and Chelan PUDs, WDFW, USFWS, NOAA Fisheries, and the Colville Confederated Tribes. The overriding goal of the HCPs are to achieve no-net impact on anadromous salmonids as they pass Wells (Douglas PUD), Rocky

Reach, and Rock Island (Chelan PUD) dams. One of the main objectives of the hatchery component of NNI is to provide species specific hatchery programs that may include contributing to the rebuilding and recovery of naturally reproducing populations in their native habitats, while maintaining genetic and ecologic integrity, and supporting harvest. The PUDs can be added as joint Section 10 permit holders (#1196) in accordance with the three HCPs such as happened in 2004.

Biological Assessment and Management Plan:
The biological assessment and management plan (BAMP) was developed by parties negotiating the HCPs in the late 1990s. The BAMP was developed to document guidelines and recommendations on methods to determine hatchery production levels and evaluation programs. It is used within the HCP as a guiding document for the hatchery programs.

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

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

Upper Columbia River ESU spring chinook (*Oncorhynchus tshawytscha*). All spring chinook in the Upper Columbia ESU were listed as Endangered under the ESA. Listed as an endangered species on March 24, 1999.

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

Upper Columbia River ESU summer steelhead trout (*Oncorhynchus mykiss).* The Upper Columbia River (UCR) Steelhead ESU was listed as Endangered on August 18, 1997. NOAA Fisheries is currently reviewing this listing in light of the decision to include hatchery produced UCR steelhead in the ESU. The final determination for this and nine other *O. mykiss* ESUs is expected in December of 2005.

Bull Trout populations (*Salvelinus confluentus*). Columbia River Distinct Population Segment) On June 12, 1998 bull trout in the Upper Columbia Distinct Population Segment (DPS) were listed as threatened under federal ESA by the USFWS.

Other salmonid species -
Sockeye salmon in the region were judged as neither in danger of extinction or likely to become so in the foreseeable future by NMFS in the west coast sockeye salmon species status review (Gustafson et al. 1997).

Other ESA-listed species of significance to the summer chinook programs include those that originate in other watersheds within the Columbia River Basin: Middle Columbia River ESU steelhead - "threatened"; Snake River ESU sockeye - "endangered"; Snake River ESU spring chinook - "threatened"; Snake River ESU fall chinook - "threatened"; Snake River ESU steelhead - "threatened"; Lower Columbia River ESU chinook - "threatened"; Lower Columbia River ESU chum - "threatened"; Lower Columbia River ESU steelhead - "threatened"; and Lower Columbia/Southwest Washington ESU coastal cutthroat - "threatened".

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

Describe the status of natural population relative to critical and viable population thresholds.
Critical habitat was designated for UCR spring chinook salmon and UCR steelhead in 2000 when NMFS published a final rule in the Federal Register (February 16, 2000 65 FR 7764). However, the critical habitat designations were vacated and remanded to NMFS for new rulemaking pursuant to a court order in April 2002. The designation of critical habitat for the UCR spring chinook salmon ESU or UCR steelhead ESU will trigger a re-initiation of ESA consultation.

- **Provide the most recent 12 year (e.g. 1988-present) progeny to parent ratios, survival data by life stage, or other measures of productivity for the listed population. Indicate sources of these data.**
- **Provide the most recent 12 year (e.g. 1988-present) estimates of annual spawning abundance estimates, or any other abundance information. Indicate sources of these data.**
- **Provide the most recent 12 year (e.g. 1988-present) estimates of annual proportions of direct hatchery origin and listed natural origin fish on the natural spawning grounds, if known. Indicate sources of these data.**

Sources for these sections are taken from the Section 10 Direct Take Permit (#1395, #1196), WDFW Application for Permits # 1395 and #1196 and ESA Section 7 Consultations for Permit # 1395 – 2002, and #1196 - 1998).

Upper Columbia River ESU summer steelhead:

The ESU includes naturally-spawned populations of steelhead in tributaries of the Columbia River upstream from the Yakima River, including the Okanogan River. The Wells Hatchery stock steelhead were included in the listed ESU. Critical habitat for the ESU was designated on February 16, 2000 and included all river reaches accessible to listed steelhead (and associated riparian zones) in Columbia River tributaries between the Yakima River and Chief Joseph Dam (NPPC 2001). Survival of natural-origin steelhead has been severely depressed such that 81% of the natural spawning escapement is hatchery-origin fish (Busby 1996 as quoted in Bugert 1998). The Wells Hatchery steelhead stock is considered essential for recovery, and is included in the listing. Since 1997, the WDFW has been developing a Wenatchee River stock for the juvenile released into the Wenatchee basin. Currently, there is probably a close resemblance between the natural and hatchery populations in this ESU because of the incorporation of naturally-spawning adults into the hatchery program and the large number of hatchery fish that have been spawning in the natural environment (65-80 percent of the spawning population in the Methow basin; Busby *et al.* 1996). Since natural replacement rates of UCR steelhead are low (0.3:1), the hatchery supplementation programs were determined to be essential for recovery and included in the endangered listing under the ESA. These hatchery fish could be used to reduce the short-term risk of extinction and aid in the recovery of the UCR steelhead ESU.

Although the life history of this ESU is similar to that of other inland steelhead, smolt ages are some of the oldest on the west coast (up to 7 years old), probably due to the ubiquitous cold water temperatures (Mullan *et al.* 1992). Adult steelhead from this ESU enter the lower Columbia between May and September with fish arriving at Wells Pool in early July. Fish enter the Wenatchee and Methow Rivers in mid-July and peak between mid-September and October. During winter, adult steelhead generally return to the warmer Columbia River and re-enter the Methow to begin spawning in mid-March after the ice has thawed. Spawning continues through May and many fish seek out higher reaches in the tributaries. Fry emergence occurs that summer and juveniles rear for two to four years prior to spring downstream migration. On April 4, 2002, NOAA Fisheries defined interim abundance recovery targets for each spawning population in this ESU (Table 5). These targets are intended to represent the number and productivity of naturally produced spawners that may be needed for recovery, in the context of whatever take or mortality is occurring. They should not be considered in isolation, as they represent the numbers that, taken together, may be needed for the population to be self-sustaining in its natural ecosystem. For UCR steelhead, the interim recovery levels are 2,500 spawners in the Wenatchee River, 500 spawners in the Entiat River, and 2,500 spawners in the Methow River (Table 4).

Table 4. Interim abundance targets of naturally produced steelhead by basin and approximate natural origin broodstock collection goal.

Basin	Interim Abundance Target	Broodstock Goal
Wenatchee	2,500	at least 104 [a]
Entiat	500	- -
Methow	2,500	maximum 123 [b]
Okanogan	600	16
Small Tributaries	200	- -
Total	**6,300**	**243**

[a] *Proportional to run-at-large in years when run is composition is 50% or greater natural origin steelhead, otherwise goal is 50% naturally produced steelhead. Total broodstock collection goal is generally about 208 steelhead..*

[b] *Combined WDFW Methow/Okanogan programs will not exceed 30% natural origin steelhead in the broodstock. Up to 373 steelhead may be collected for broodstock total.*

Returns of both hatchery and naturally produced steelhead to the UCR basin have increased in recent years. The average 1997-2001 return counted through the Priest Rapids Dam fish ladder was approximately 12,900 fish. The average for the previous five years (1992-1996) was 7,800 fish. Abundance estimates of returning naturally produced UCR steelhead have been based on extrapolations from mainstem dam counts and associated sampling information (e.g., hatchery/natural fraction, age composition). The natural component of the annual steelhead run over Priest Rapids Dam increased from an average of 1,040 (1992-1996), representing about 15 percent of the total adult count, to 2,200 (1997-2001), representing about 17 percent of the adult count during this period of time (BRT 2003). In terms of natural production, recent population abundances for both the Wenatchee/Entiat river aggregate population and the Methow population remain well below the interim recovery levels developed for these populations (BRT 2003). A 5-year geometric mean (1997-2001) of approximately 900 naturally produced steelhead returned to the Wenatchee and Entiat rivers (combined) compared to a combined abundance target of 3,000 fish. Although this is well below the interim recovery target, it represents an improvement over the past (an increasing trend of 3.4 percent per year). However, the average percentage of natural fish for the recent 5-year period dropped from 35 to 29 percent, compared to the previous status review. For the Methow population, the 5-year geometric mean of natural returns over Wells Dam was 358. Although this is well below the interim recovery target, it represents an improvement over the past (an increasing trend of 5.9 percent per year). In addition, the estimated 2001 return (1,380 naturally produced spawners) was the highest single annual return in the 25-year data series. However, the average percentage of natural origin spawners dropped from 19 percent for the period prior to the 1998 status review to 9 percent for the 1997 to 2001 returns. Naturally produced steelhead made up an average of 17.8 percent of the steelhead run at Priest Rapids Dam during the 18-year period from 1986 to 2001. These natural origin steelhead are not equally distributed among the UCR tributary basins. Mullen *et al*. (1994) reported annual escapement to the Methow basin at only 10 percent natural origin steelhead; however, in recent years the WDFW (2002) report natural origin steelhead composition of 5 to 11 percent in 1998 through 2000 at Wells Dam. The escapement to the Wenatchee basin from 1998 to 2000 averages 430 natural origin steelhead.

The average 2000- 2003 return counted through the Priest Rapids Dam fish ladder was approximately 18,620 fish with 3,049 wild fish. The 1997-2001 return counted through the Priest Rapids Dam fish ladder was approximately 12,900 fish. The average for the previous five years (1992-1996) was 7,800 fish. By October 2004, over 18,000 steelhead had passed Priest Rapids Dam by early October. The natural component of the annual steelhead run over Priest Rapids Dam

increased from an average of 1,040 (1992-1996), representing about 15 percent of the total adult count, to 2,200 (1997-2001), representing about 17 percent of the adult count during this period of time (BRT 2003). In terms of natural production, recent population abundances for both the Wenatchee/Entiat river aggregate population and the Methow population remain well below the interim recovery levels developed for these populations (BRT 2003).

Upper Columbia River ESU Spring Chinook:

The UCR spring chinook salmon ESU, listed as endangered on March 24, 1999 (64 FR 14308), includes all natural-origin stream-type chinook salmon from river reaches above Rock Island Dam and downstream of Chief Joseph Dam, including the Wenatchee, Entiat, and Methow River Basins (Myers *et al.* 1998). All stocks, with the exception of the Methow stock, were considered by WDF *et al.* (1993) to be of native origin, of natural production type, and as depressed in status. When listing the UCR spring chinook salmon as endangered, NMFS included six hatchery populations as part of the ESU: Chewuch River, Methow River, Twisp River, Chiwawa River, White River, and Nason Creek. These six hatchery populations were considered to be essential for recovery and were therefore listed as part of the ESU. Hatchery populations that were derived from Carson spring chinook salmon stock at Leavenworth, Entiat and Winthrop National Fish Hatcheries were not included as part of the ESU.

NMFS has proposed Interim Recovery Abundance Levels and Cautionary Levels (Ford *et al.*2001). Cautionary Levels were characterized as natural origin abundance levels that the population fell below only about 10 percent of the time during a historical period when it was considered to be relatively healthy. The three independent populations of spring chinook salmon identified for the ESU include those that spawn in the Wenatchee, Entiat, and Methow Basins (Ford *et al.* 2001).

All three of the existing UCR spring chinook salmon naturally reproducing populations have exhibited similar downward trends and patterns in abundance over the past 40 years (NMFS 2003c, 2003d, 2003e). Assuming that population growth rates were to continue at 1980-2000 levels, UCR spring chinook salmon populations are projected to have very high probabilities of 90 percent decline within 50 years (87 to 100 percent). Redd counts in the three basins have improved in recent years, largely because of natural spawning by artificially propagated spring chinook salmon (Grassell 2003; Grassell 2004; Mosey and Murphy 2002; Hamstreet and Carie 2004; Humling and Snow 2004). Artificially propagated juvenile spring chinook salmon are released into the Chiwawa River with the expectation that as adults they will return and spawn in the Chiwawa River. In reality, these hatchery released fish have contributed an average of 50 percent of the spawners in the Chiwawa River and an average of 25 percent of the spawners in Nason Creek (Andrew Murdoch, WDFW, pers. com.). The propagation program spring chinook salmon that return to spawn in Nason Creek are considered strays and of potential adverse risk to the Nason Creek component of the population; measures to improve the fidelity of hatchery reared spring chinook salmon to the Chiwawa River are being explored. Additionally, a new artificial propagation program that releases locally derived juveniles into Nason Creek is likely to occur within the next five years. The reproductive effectiveness of these hatchery-origin salmon is not known at this time. However, preliminary indications in the Wenatchee River Basin suggest that the Chiwawa spring chinook salmon program is contributing to natural reproduction in successive generations (Andrew Murdoch, WDFW, pers. com.). Successful reproduction over generations has not been demonstrated for the other basins as yet. A summary of recent redd count data and spawner composition is provided in Table 10. All three of the existing UCR spring chinook salmon naturally reproducing populations have exhibited similar downward trends and patterns in abundance over the past 40 years (NMFS 2003c, 2003d, 2003e). Assuming that population growth rates were to continue at 1980-2000 levels, UCR spring chinook salmon populations are projected to have very high probabilities of 90 percent decline within 50 years (87 to 100 percent). Redd counts in the three basins have improved in

recent years, largely because of natural spawning by artificially propagated spring chinook salmon (Grassell 2003; Grassell 2004; Mosey and Murphy 2002; Hamstreet and Carie 2004; Humling and Snow 2004). Artificially propagated juvenile spring chinook salmon are released into the Chiwawa River with the expectation that as adults they will return and spawn in the Chiwawa River. In reality, these hatchery released fish have contributed an average of 50 percent of the spawners in the Chiwawa River and an average of 25 percent of the spawners in Nason Creek (Andrew Murdoch, WDFW, pers. com.). The propagation program spring chinook salmon that return to spawn in Nason Creek are considered strays and of potential adverse risk to the Nason Creek component of the population; measures to improve the fidelity of hatchery reared spring chinook salmon to the Chiwawa River are being explored. Additionally, a new artificial propagation program that releases locally derived juveniles into Nason Creek is likely to occur within the next five years. The reproductive effectiveness of these hatchery-origin salmon is not known at this time. However, preliminary indications in the Wenatchee River Basin suggest that the Chiwawa spring chinook salmon program is contributing to natural reproduction in successive generations (Andrew Murdoch, WDFW, pers. com.). Successful reproduction over generations has not been demonstrated for the other basins as yet.

While some improvement can be seen in recent years, the ESU is still at critically low levels compared to both historic production and the desired escapement levels—particularly for natural fish. Therefore, while there is some cause for guarded optimism, NMFS finds that there has been no genuine change in the species' status since they were listed as endangered, and the biological requirements are not being met with respect to abundance, distribution, or overall trend.

Provide the most recent 12-year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.

Upper Columbia River ESU Spring Chinook:

The NRR for the Wenatchee, Entiat, and Methow populations has ranged from 1.4 to 0.4 from 1958 to 1995 broodyears. The NRR has not been above 1.0 since the mid-1970's for the Wenatchee and Methow populations and the mid-1980's for the Entiat population (Ford et al., 2001). Even with planned increases in mainstem juvenile passage survival anticipated from the Habitat Conservation Plan, additional survival of 20 to 50% is necessary to achieve NRR greater than 1.0 (Cooney, 2000 Draft). UCR Spring Chinook are extinct in the Okanogan River basin.

Upper Columbia River ESU summer steelhead:

The Natural Return Ratios (NRR) or wild adult-to-adult survival rates for the Methow/Okanogan populations have been estimated as between 0.05 – 0.35 from 1975 to 1991. For the Wenatchee/Entiat populations, the NRR are estimated to have ranged from 0.1 – 0.9 during this same time (Ford et al., 2001). The Biological Requirements Committee concluded that the UCR steelhead populations are not able to sustain themselves naturally, but it is not clear if they would go extinct without ongoing supplementation. The uncertainty surrounding the reproductive success of hatchery steelhead confounds these analyses. Even with planned increases in mainstem juvenile passage survival anticipated from the Habitat Conservation Plan, additional survival of 20 to 50% is necessary to achieve NRR greater than 1.0 (Cooney, 2000 Draft).

In areas above Priest Rapids Dam, several methods have been used to estimate the number of steelhead spawners and juveniles that the available habitat may be capable of supporting. These estimates for the UCR basin range from 1,603 to 8,281 depending on the estimation method (Ford *et al*. 2001). The Interior Columbia Basin Technical Recovery Team (TRT) is reviewing the available

data and is expected to provide escapement recommendations for recovery of all ESA-listed UCR species. The WDFW proposes to manage artificially propagated steelhead at levels above the interim abundance targets developed by NMFS (Lohn 2002) until the TRT recommendations are available. NMFS has not developed abundance targets for the Okanogan basin or other smaller tributaries.

Wild production

The population status of listed steelhead smolts produced in the region has been estimated by WDFW (L. Brown, WDFW pers. comm). The number of steelhead juveniles that may be produced are indicated by the following subbasin production capacities for wild steelhead smolts in the region (WDF et al. 1993; MCMCP 1997):

- Wenatchee 62,167
- Entiat 12,739
- Methow 58,552
- Okanogan 17,570
- Total 151,028

Recent ten-year (1987-96) average seeding levels estimated for the region indicate potential wild smolt production at 109.5% of the modeled production capacities (MCMCP 1997):

- Wenatchee 73,371
- Entiat 10,728
- Methow 65,586
- Okanogan 15,660
- Total 165,345

Provide the most recent 12 year (e.g. 1988-present) annual spawning abundance estimates, or any other abundance information. Indicate source of these data.

UCR Steelhead:

Table 5. Upper Columbia River steelhead run composition at Wells Dam (Methow and Okanogan basins) (Letter from Kirk Truscott, WDFW, July 9, 2003).

	Artificially Propagated		Naturally Produced		
Year	Number	Percent	Number	Percent	Total R
1998	2,849	92%	234	8%	3,0
1999	3,511	89%	447	11%	3,9
2000	6,142	92%	541	8%	6,6
2001	18,034	95%	889	5%	18,9
2002	9,098	93%	706	7%	9,8

Wenatchee and Entiat Rivers

Between 1967 and 2003, an average of 761 naturally produced steelhead spawned in the Wenatchee River (range; 70-2,864). In the Entiat River, spawning escapement has ranged from 9 to 366, averaging 97 fish. The 12-year geometric mean of spawners in the Wenatchee River has ranged from 185 to 919, and is currently (i.e., 2003) 716 (Table 7). For the Entiat River, the 12-year

geometric mean has ranged from 24 to 118 and is currently 92. The returning number of fish to both tributaries is auto-correlated since they were derived from the same aggregate. Therefore, the return per spawner is reported for both populations combined. In the Wenatchee and Entiat rivers, the return per spawner has averaged 1.42 (range; 0.13-4.73) if hatchery fish produce the equivalent number of returning spawners as naturally produced fish, and averages 0.28 (range; 0.05-0.79) if hatchery fish do not produce any returning spawners. The 12-year geometric mean of the return per spawner has averaged 1.22 (range 0.71-1.96) if hatchery fish are equivalents to naturally produced fish, or 0.26 (0.18-0.32) if they do not contribute (Table 6).

Table 6. Summary statistics for determining naturally produced (NP) steelhead escapement and run reconstruction for the Wenatchee and Entiat Rivers

	Stlhd. Passed	% NP	NP Escapement		NP escpmt.		GEO-M NP escpmt.		Returns		Return per spawner for Wenatchee and Entiat			
				> harvest & presp.									GEO-M	GEO-M
	(RI-WLS)	Wen., Ent.	<hrvst.	mortality	Wen.	Ent.	Wen.	Ent.	Wen.	Ent.	H. eff. = 0	effect. = 1	H. eff. = 0	H. eff. = 1
1984	8,464	0.17	1463	919	683	87	220	28	1883	241	2.76	0.43	1.96	0.32
1985	12,132	0.21	2515	1859	1382	177	257	33	1406	180	1.02	0.19	1.91	0.32
1986	9,582	0.21	1967	1770	1315	168	323	41	1011	129	0.77	0.20	1.66	0.30
1987	7,239	0.41	2980	2682	1993	255	416	53	723	92	0.36	0.16	1.40	0.28
1988	4,840	0.33	1588	1430	1062	136	482	62	1125	144	1.06	0.36	1.37	0.29
1989	4,751	0.53	2507	2256	1676	214	538	69	536	69	0.32	0.18	1.31	0.30
1990	3,131	0.28	888	800	594	76	604	77	524	67	0.88	0.26	1.22	0.29
1991	3,176	0.49	1550	1395	1036	133	669	86	432	55	0.42	0.26	1.08	0.29
1992	5,451	0.23	1241	1117	830	106	761	97	485	62	0.58	0.15	0.90	0.25
1993	2,335	0.32	759	683	507	65	784	100	437	56	0.86	0.28	0.81	0.23
1994	3,457	0.20	704	634	471	60	919	118	301	39	0.64	0.13	0.79	0.22
1995	3,233	0.31	1006	906	673	86	919	117	369	47	0.55	0.18	0.71	0.22
1996	3,177	0.19	588	529	393	50	877	112	1111	142	2.82	0.56	0.71	0.22
1997	3,619	0.17	614	552	410	52	793	101	1941	248	4.73	0.74	0.81	0.25
1998	1,979	0.21	408	367	273	35	696	89						
1999	2,765	0.24	663	597	443	57	614	78						
2000	4,236	0.42	1789	1610	1196	153	620	79						
2001	10,084	0.42	4284	3855	2864	366	648	83						
2002	5,817	0.33	1931	1738	1291	165	691	88						
2003	17,481	0.28	2375	2137	1588	203	716	92						
Avg.:	**4,825**	**0.29**	**1,352**	**1,024**	**761**	**97**	**534**	**68**	**643**	**82**	**1.42**	**0.28**	**1.22**	**0.26**
Min.:	**1,305**	**0.14**	**196**	**94**	**70**	**9**	**185**	**24**	**110**	**14**	**0.13**	**0.05**	**0.71**	**0.18**
Max.:	**17,481**	**0.80**	**4,284**	**3,855**	**2,864**	**366**	**919**	**118**	**1,941**	**248**	**4.73**	**0.79**	**1.96**	**0.32**

RI-WLS Rock Island dam to Wells Dam; Wen = Wenatchee, Ent = Entiat; Stlhd = Steelhead; hrvst = harvest; escpmt = escapement; Geo-M = Geometric mean; H. eff = Hatchery Effective

Data from the Upper Columbia Salmon Recovery Plan June 2005 Draft.

UCR Spring Chinook

Table 7. Estimates of the number of natural-origin spring chinook returning to subbasins for each independent population of Upper Columbia River spring chinook salmon and preliminary Interim Recovery Abundance and Cautionary levels.

Year	Subbasin		
	Wenatchee River	Entiat River	Methow River
1979	1,154	241	554
1980	1,752	337	443
1981	1,740	302	408
1982	1,984	343	453
1983	3,610	296	747
1984	2,550	205	890
1985	4,939	297	1,035
1986	2,908	256	778
1987	2,003	120	1,497
1988	1,832	156	1,455
1989	1,503	54	1,217
1990	1,043	223	1,194
1991	604	62	586
1992	1,206	88	1,719
1993	1,127	265	1,496
1994	308	74	331
1995	50	6	33
1996	201	28	126
1997	422	69	247
1998	218	52	125
1999[1]	119	64	73
2000	*1,295*	*180*	*811*
1996-2000 average	451	79	276
Recovery Abundance	**3,750**	**500**	**2,000**
Cautionary Abundance	**1,200**	**150**	**750**

[1] Estimates for 1999 are preliminary; estimates for 2000 (italics) are based on the preseason forecast (actual return data not available 10/17/00).

Provide the most recent 12 year (e.g. 1988-present) estimates of annual proportions of direct hatchery origin and listed natural origin fish on the natural spawning grounds, if known. Indicate sources of these data.

UCR Steelhead:

See Table 5.

UCR Spring chinook:

Table 8. Annual total redd counts and proportion of artificially propagated to natural origin spring chinook salmon by tributary basin (Andrew Murdoch, WDFW, pers. comm.).

Basin	Return Year								
	1994	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Redd Count									
Wenatchee Basin [a]									
Chiwawa River	82	13	23	82	39	34	128	1,046	345
Nason Creek	27	7	33	55	29	8	100	367	294
White River	3	2	12	15	5	1	8	93	42
Entiat Basin	34	13	20	37	24	27	73	202	112
Methow Basin									
Twisp River	32	4	0	32	0	7	99	370	109
Chewuch River	27	2	0	55	0	6	20	1,037	301
Methow River	64	9	0	56	0	17	232	2,828	722
Proportion of Hatchery to Natural Origin Spawners [b]									
Wenatchee Basin [a]									
Chiwawa River	0.40	0.05	0.43	0.70	0.56	0.33	0.56	0.74	0.63
Nason Creek	0.23	0	0.33	0.63	0.19	0	0.24	0.61	0.49
White River	0	0	0	0	0	0	0	0.21	0.28
Entiat Basin [c]	0	0	0.20	0	0	0	0.58	0.25	0.18
Methow Basin									
Twisp River	0	0	0	0.25	0	0.64	0.96	0.33	027
Chewuch River	0.29	0	0	0.33	0	0.64	0.42	0.64	087
Methow River	0.14	0	0	0.37	0	0.39	0.91	0.95	0.95

[a] *Areas upstream of Tumwater Dam*

[b] *Based on coded-wire tag recoveries*

[c] *Minimum values, some carcasses were of unknown origin*

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.

Sources for this section are taken directly from the Section 10 Direct Take Permit (#1196), WDFW Application for Permit # 1196 and ESA Section 7 Consultation for Permit # 1196,1300, 2002.

Section 10 Permit #1196 - Take Descriptions and/or Levels

This permit is for activities to be conducted over approximately a five-year period. Annual takes listed below are subject to NOAA Fisheries' annual authorization process (see Section C - Reporting and Annual Authorization Requirements) during the period that the Section 10 permit is valid.

I. Supplementation activities as conditioned by Section 10 Permit # - 1196 include:

- Collection of broodstock through trap operations on the Twisp River, Chewuch River, at Foghorn Dam on the Methow River, and at Methow Hatchery for the Methow River populations (with potential collections at Wells Dam), and on the Chiwawa River and Nason Creek or Tumwater Dam for Wenatchee River Basin-origin spring chinook salmon;
- Transfer of adults and fertilized eggs between the Methow Hatchery and the Winthrop NFH; holding and artificial spawning of collected adults at the Methow and Eastbank Hatcheries;
- Incubation and propagation from the fertilized egg through the smolt life stage at Methow and Eastbank Hatcheries;
- Holding and artificial spawning of collected adults at the Methow and Eastbank Hatcheries;
- Transfer of fingerlings and pre-smolts from the two hatcheries for rearing in acclimation ponds on the Chiwawa, Twisp, and Chewuch Rivers; and the release of smolts into the Methow, Chewuch, Twisp, and Chiwawa Rivers from the WDFW hatcheries and acclimation ponds on those systems.
- Release of smolts into the Methow, Chewuch, Twisp, and Chiwawa Rivers from the hatcheries and acclimation ponds in those systems;
- Monitoring of the programs in the hatchery environment using standard techniques such as growth and health sampling;
- Monitoring of the programs in the natural environment using standard techniques such as juvenile fish traps and adult spawner surveys.

Intentional Take – Hatchery and Monitoring activities include both spring chinook programs on the Wenatchee and Methow River systems.

1. Adult and jack endangered UCR spring chinook salmon (both natural and hatchery origin) that return to the Chiwawa River and Nason Creek weirs and Tumwater Dam each year may be captured, anesthetized, and handled (enumerated, measured, sampled for tissues and/or scales). Tissue samples and/or scales may be transferred to WDFW's Scale Analysis Laboratory in Olympia or WDFW's Genetic Stock Identification Laboratory in Olympia for archival storage and/or analysis.

2. Of the combined total number of spring chinook salmon adults and jacks that return to the Chiwawa River and Nason Creek each year, WDFW may retain no more than 400 or one-third, whichever is less, for broodstock to meet the longterm smolt production goals of the program. The ESA-listed adult chinook salmon retained for broodstock may be transferred to transport vehicles and transported to WDFW's spawning facility.

3. The adult and jack endangered UCR spring chinook salmon not retained for broodstock must be released unharmed above the respective trapping facility for natural spawning immediately after being enumerated.

4. The ESA-listed adult fish retained for broodstock may be marked and/or tagged, treated with antibiotics, placed in holding ponds, and spawned. Sperm from ESA-listed adult males may be cryopreserved for potential future use. Carcasses of the ESA-listed fish spawned in captivity may be outplanted in the Chiwawa River watershed for nutrient enrichment.

5. The resulting eggs generated from the supplementation program may be incubated and the ESA-listed juvenile fish progeny may be reared in captivity. ESA-listed juvenile fish produced from

WDFW's supplementation program may be tagged/marked with coded wire tags, passive integrated transponders, fin clips, and/or other biological identifiers.

6. Up to 672,000 juvenile, endangered, artificially propagated, UCR spring chinook salmon, progeny generated from the supplementation program, may be transported from the hatchery and released into acclimation ponds on the Chiwawa River for subsequent volitional out-migration and/or released directly into the Chiwawa River when they are ready to out-migrate.

7. ESA-listed juvenile fish within the hatchery environment may be monitored to acquire meristic and morphological information or sacrificed to obtain otoliths for future reference and/or to obtain pertinent pathological or physiological information. Indirect mortalities of adult ESA-listed fish associated with capturing, handling, and transporting activities must not exceed 5 percent of the total adult fish collected.

8. Adult and jack, endangered, UCR spring chinook salmon (both natural and hatchery origin) that return to Wells Dam, the Twisp River trap, the Chewuch River trap, and Foghorn Dam each year may be captured, anesthetized, and handled (enumerated, measured, sampled for tissues and/or scales). Tissue samples and/or scales may be transferred to WDFW's Scale Analysis Laboratory in Olympia or WDFW's Genetic Stock Identification Laboratory in Olympia for archival and/or analysis.

9. WDFW may retain adult and jack, endangered, UCR spring chinook salmon that return to Wells Dam (and when necessary the Twisp River trap, Chewuch River trap, Foghorn Dam, Winthrop National Fish Hatchery (NFH), and/or the Methow Fish Hatchery) for use as broodstock. Broodstock collected by WDFW may be used in WDFW's and in U.S. Fish and Wildlife Service's (USFWS) Methow River Basin supplementation programs. Of the adult and jack spring chinook salmon captured and retained for broodstock at Wells Dam, the Twisp River trap, the Chewuch River trap, and Foghorn Dam, WDFW shall retain a representative sample of both hatchery and naturally produced fish. The annual production goal for WDFW's supplementation program at Methow Fish Hatchery of 550,000 smolts shall be used until modifications at the fish hatchery is made. Undethis production goal scenario, when the total annual adult return to Wells Dam is predicted to be 668 adults or fewer, then all of the adult fish may be retained and placed into WDFW and USFWS' adult-based supplementation programs. When the total annual adult return to Wells Dam is predicted to be 669 to 964, up to 69 percent of the adult run may be placed into WDFW and USFWS' adult-based supplementation programs and a minimum of 296 adults shall be passed upstream of the dam for natural spawning. When the total annual adult return to Wells Dam is predicted to be over 964, the retention of adults shall be at levels that will meet maximum production objectives for WDFW and USFWS' programs.

10. The ESA-listed adult chinook salmon retained for broodstock may be transferred to transport vehicles and transported to WDFW's spawning facility or USFWS' Winthrop NFH. Handling of ESA-listed adult fish by USFWS is authorized under a separate take authorization.

11. The adult and jack, endangered, UCR spring chinook salmon not retained for broodstock must be released unharmed above the respective trapping facility for natural spawning immediately after being enumerated.

12. The ESA-listed adult fish retained for broodstock may be marked and/or tagged, treated with antibiotics, placed in holding ponds, and spawned. Sperm from ESA-listed adult males may be cryopreserved for potential future use. Carcasses of the ESA-listed fish spawned in captivity may be

outplanted in the Methow River watershed for nutrient enrichment if disease protocols as determined by fisheries co-managers are met.

13. The resulting eggs generated from the supplementation program may be incubated and the ESA-listed juvenile fish progeny may be reared in captivity. ESA-listed juvenile fish produced from WDFW's supplementation program may be tagged/marked with coded wire tags, passive integrated transponders, fin clips, and/or other biological identifiers.

14. Up to 550,000 juvenile, endangered, artificially propagated, UCR spring chinook salmon, progeny generated from WDFW's supplementation program, may be transported from the hatchery and released into acclimation ponds on the Chewuch and Twisp rivers for subsequent volitional out-migration and/or released directly into the Chewuch River when they are ready to out-migrate.

15. ESA-listed juvenile fish within the hatchery environment may be monitored to acquire meristic and morphological information or sacrificed to obtain otoliths for future reference and/or to obtain pertinent pathological or physiological information. Indirect mortalities of adult ESA-listed fish associated with capturing, handling, and transporting activities must not exceed 5 percent of the total adult fish collected.

16. The progeny produced from the Methow Fish Hatchery shall be released onstation or transferred to the Chewuch Pond as subyearlings for acclimation and release. The progeny of known Twisp River spring chinook salmon shall be acclimated and released from the Twisp Pond or on-station. A portion of the eggs/progeny from the Methow Fish Hatchery may be transferred to the Winthrop NFH for rearing and release.

Incidental Take

1. Incidental take of ESA-listed UCR steelhead during WDFW's broodstock collection activities is authorized. During collection of spring chinook salmon broodstock at Wells Dam, WDFW may handle up to 100 listed steelhead when trapping occurs at both adult fish ladders. Trapping of spring chinook salmon in both ladders is necessary when the annual adult return is such that all adults collected will be retained for broodstock. As the annual return increases, trapping will be limited to the west ladder which reduces the potential to handle listed steelhead to less than 10 adults. Mortalities from the incidental take of listed steelhead is expected to be no more than 9 adults.

2. Incidental take in the form of capture, handle, and release will not exceed 20 percent of the tributary population.

3. The mortality take shall not exceed one percent of the trapped UCR steelhead. The existence of concurrent WDFW artificial propagation programs for listed steelhead and unlisted salmon at the same facilities that also include monitoring and research activities complicate the ability to identify incidental takes occurring during most of the activities associated with the UCR spring chinook salmon programs.

In the absence of quantitative estimates of incidental take, NMFS will monitor fish release numbers/locations and limit broodstock collection operations, hatchery operational practices, and fish release practices as reported by the Permit Holders and other sources to ensure that incidental takes do not operate to the disadvantage of ESA-listed species, the Permit Holders must suspend those activities that result in the incidental takes until a reasonable solution is achieved, this permit is amended, and/or the programs are reevaluated under Section 7 of the ESA.

Special Conditions

1. In cooperation with the Joint Fishery Parties and the Mid-Columbia Coordinating Committee, WDFW shall develop annual broodstock objectives and site-based broodstock collection protocols for the UCR spring chinook salmon supplementation program. The annual broodstock objectives and protocols shall be submitted to the Hatcheries and Inland Fisheries Branch, NOAA Fisheries by April 15 each year (see Operational Reports and Notification Requirement D.1). NOAA Fisheries will provide a letter of approval, if it is determined that the annual broodstock objectives and protocols are consistent with the terms and conditions of this permit.

2. Each year, WDFW shall operate the Nason Creek and Chiwawa River weirs from June 1 to September 10. The annual broodstock collection protocols will determine the daily operations at the Nason Creek and Chiwawa River weirs and the Tumwater Dam trap.

3. WDFW shall remove the captured fish from the traps daily when the traps are operating. Those fish not retained for broodstock shall be passed upstream of the weir for natural spawning after being handled for enumeration and the collection of biological information.

4. WDFW must provide seven-day-a-week on-site monitoring of the adult traps and acclimation sites. The adult trap/holding box must be secured with locking lids or other mechanisms to prevent vandalism and/or unauthorized take.

5. WDFW shall mark all hatchery-produced Nason Creek and Chiwawa River spring chinook salmon to allow the segregation of adults for broodstock and evaluations of escapement and natural production in the Wenatchee River Basin (see Reporting and Annual Authorization Requirement C.4.).

6. After the adult fish are spawned, WDFW shall incinerate or bury all UCR spring chinook salmon carcasses if there is not a research, educational, or public outreach purpose identified, or distribute the carcasses in the Wenatchee River watershed for stream fertilization purposes if disease protocols as determined by the fisheries co-managers are met.

7. WDFW shall report to the Hatcheries and Inland Fisheries Branch, NOAA Fisheries annually on the number of adult, endangered, UCR spring chinook salmon collected and retained for broodstock and the details of the spawning procedures that were implemented. The report shall include a description of the origin (in-basin or out-of-basin; naturally produced or hatchery-produced (when possible)), as well as the proportion of males and females, of all spring chinook salmon used for artificial spawning. WDFW shall also provide detailed information (number, origin, sex, condition) on the adult fish released for natural spawning (see Reporting and Annual Authorization Requirement C.1).

8. Prior to any hatchery-produced juvenile fish releases and/or transfers, WDFW must receive approval from the Hatcheries and Inland Fisheries Branch, NOAA Fisheries for the number, stock origin, release dates, and release location(s) of the fish to be released and/or transferred. A plan describing proposed fish releases or transfers, developed annually by the Joint Fishery Parties and the Mid-Columbia Coordinating Committee, must be submitted to NOAA Fisheries two months prior to any such releases or transfers (see Operational Reports and Notification Requirement D.4).

9. With the cooperation of the USFWS, WDFW shall develop an identification method for each of the production groups in the Methow River Basin (Twisp River stock, Chewuch River stock, Methow

River composite stock Winthrop NFH Carson-stock spring chinook and others) to allow for the broodstock segregation of returning adults and evaluation of escapement and natural production (see Reporting and Annual Authorization Requirement C.4.).

10. WDFW shall determine the origin (in-basin or out-of-basin; naturally produced or hatchery-produced (when possible)) of all spring chinook salmon retained prior to spawning. WDFW shall avoid using marked spring chinook salmon originating outside the Mid-Columbia River region for broodstock. Coded wire tags shall be read and the origin of each adult spawner shall be determined. The progeny of the adults captured at Wells Dam that are from the Entiat River or the Wenatchee River programs shall be transferred to their hatchery of origin if consistent with fish health protocols. Adult hatchery fish that are determined to originate from Winthrop NFH shall be transferred to Winthrop NFH.

11. WDFW shall individually mark/tag or segregate collected adults to identify them by time of arrival. If too many adults are collected because the actual run size differs substantially from the predicted run size, adults may be selected for return to the river for natural spawning. Late arriving adults shall be genotyped through in-situ scale pattern analysis and maturation timing to help ensure that ocean-type chinook salmon are not inadvertently included in the broodstock.

12. WDFW shall spawn both listed hatchery x natural and natural x natural crosses to the extent possible and evaluate the success of the two types of crosses. When possible, naturally produced fish retained for broodstock shall represent the natural-origin population in terms of age composition, sex ratio, and run timing (see Reporting and Annual Authorization Requirement C.3.).

13. To the greatest extent possible, WDFW shall maintain known Twisp River spring chinook salmon as a separate broodstock within the hatchery. The progeny of known Twisp River spring chinook salmon shall be distinctly marked for identification purposes.

14. To minimize the lateral transfer of pathogens, a sterilized needle must be used for each individual injection when PIT-tagging ESA-listed fish.

15. All ESA-listed fish handled out-of-water for the purpose of recording biological information must be anesthetized. Anesthetized fish must be allowed to recover (e.g. in a recovery tank) before being released. Fish that are simply counted must remain in water but do not need to be anesthetized. 16. To reduce and control fish disease incidences, WDFW will use the disease control procedures identified in the operations plans and adhere to the Washington Co- Manager, Pacific Northwest Fish Health Protection Committee and IHOT fish disease control policies.

Trapping Operations

Adult spring chinook broodstock are trapped and collected on the lower Chiwawa River (RKm 2.0) and at the Tumwater Dam on the Wenatchee River (RKm 52.0). See HGMP Section 7.2 for a more detailed description. The Chiwawa River trap/weir, the primary broodstock collection site, retains no more than 30% of the naturally produced adults returning to the river, and maintains a minimum of 33% of the broodstock as naturally-produced adults. The Tumwater Dam trap is a secondary broodstock collection site, and is operated when runs are diminishes to augment numbers of fish collected at the Chiwawa location. Only marked Chiwawa hatchery-origin chinook are collected at Tumwater Dam for inclusion as broodstock in the program. Reporting requirements of mortalities on listed spring chinook from trapping, release or broodstock holding activities are reported in Section 10 Annual Reports by WDFW.

Hatchery Production: Density-Dependent Effects

Hatchery salmon smolt releases may cause displacement of rearing natural salmon and steelhead juveniles from occupied stream areas, leading to abandonment of advantageous feeding areas or premature out-migration (Pearsons *et al.* 1994). The presence of large numbers of hatchery produced fish may also alter natural fish behavior patterns, which may increase their vulnerability to predation (NMFS 1995). Adverse effects of the release of hatchery pre-smolt salmonids are reviewed by Steward and Bjornn (1990) and are discussed under the competition section below. The out-planting of only volitionally migrating smolts by the programs will contribute to a decrease in density-dependent effects on natural fish, by limiting interactions between natural and hatchery fish. Releases of hatchery smolts coincident with managed releases of water (flow augmentation) will also help accelerate downstream migration of hatchery salmon and steelhead, further reducing spatial and temporal overlaps with listed fish and potential adverse behavioral effects.

As stated in Section III.A., the carrying capacity of the Columbia River mainstem and estuary ecosystems is very difficult to determine and this uncertainty has fueled debate over the density dependent effects of hatchery fish on natural populations in this area. Within the Wenatchee River Basin, recent ten-year seeding levels were at 42% of capacity and in the Methow River Basin seeding levels were only 18.9% of capacity (Table 4). The short-term goal for the combined supplementation and captive broodstock programs as originally proposed was to release 900,000 smolts (75% of the production capacity) into the Wenatchee River basin (Table 9). The current production goal for the supplementation program is 672,000 smolts (a combination of Chiwawa River and Nason Creeks) and is same as the proposed long-term objective or 56% of the production capacity (Table 9).

Table 9. Estimated spring chinook salmon smolt production capacities compared to estimated seeding levels (WDFW 1998a).

Watershed	Smolt production capacity	Recent ten-year seeding levels	Percent of capacit
Wenatchee River	1,200,000	510,863	42.6
Methow River	826,359	155,734	18.8
Totals	2,026,359	666,597	32.9

The Methow River basin short-term goal as originally proposed was 1.474 million smolts from the supplementation and captive broodstock programs (Table 9). The proposed long-term goal was for 738,000 smolts from the supplementation program at the Methow SFH and an additional 800,000 from the Winthrop NFH. Currently the goal for both facilities is the release up to 1,150,000 spring chinook smolts (550,000 at Methow and 600,000 at Winthrop NFH). The production goals are high when compared to the basin's carrying capacity. This is due to the current low smolt-to-adult survival observed for the Methow River and Wenatchee River spring chinook salmon. Smolt-to-adult survival rates for the 1992 and 1993 broodyears have ranged from 0.01% to 0.08% (BAMP 1998). The smolt-to-adult survival rates for the most recent broodyears are expected to show improvements. To achieve adult escapement goals, at the present mainstem passage and ocean conditions, smolt releases in excess of the carrying capacity of the basin are necessary. For this analysis, the carrying capacity is the number of smolts that

The resulting eggs generated from the supplementation program may be incubated and the ESA-listed juvenile fish progeny may be reared in captivity. ESA-listed juvenile fish produced from WDFW's supplementation program may be tagged/marked with coded wire tags, passive integrated transponders, fin clips, and/or other biological identifiers. Up to 672,000 juvenile, endangered, artificially propagated, UCR spring chinook salmon, progeny generated from the supplementation program, may be transported from the hatchery and released into acclimation ponds on the Chiwawa River for subsequent volitional out-migration and/or released directly into the Chiwawa River when they are ready to out-migrate. ESA-listed juvenile fish within the hatchery environment may be monitored to acquire meristic and morphological information or sacrificed to obtain otoliths for future reference and/or to obtain pertinent pathological or physiological information. Indirect mortalities of adult ESA-listed fish associated with capturing, handling, and transporting activities must not exceed 5 percent of the total adult fish collected. Factors associated with hatchery supplementation of smolts that may lead to take of the listed population include the potential loss of genetic diversity and fitness in the supplemented population resulting from outbreeding depression, inbreeding depression, genetic drift, or trait selection (Hard et al. 1992; Cuenco et al. 1993; Campton 1995). Ecological effects on natural fish by hatchery steelhead smolts released into the region through the supplementation program may also lead to takes in the tributaries, the Columbia mainstem and in the estuary. These effects can include competition, predation, disease transmission, and behavioral modification.

Table 10. Short-term and long-term hatchery production goals for the supplementation and captive broodstock programs as originally proposed in the application.

Population	Program Type	Short-Term Objective	Long-Term Objective
Chiwawa River	Supplementation	300,000	672,000
White River	Captive Broodstock	240,000	To be determined
Nason Creek	Captive Broodstock	360,000	To be determined
Methow River (WDFW)	Supplementation	550,000	738,000
Methow River (USFWS)	Supplementation	600,000	800,000
Twisp River	Captive Broodstock	324,000	To be determined

Genetic and Ecological Effects on Natural Populations:

The proposed supplementation program is designed to preserve and rebuild naturally producing spring chinook populations in the upper Columbia River Region. Natural spring chinook salmon populations are not replacing themselves and extinction of one or all of the extant runs appears likely without the proposed program, as assisted by changes in hydroelectric dam operations, harvest activities, and competing land use actions. Risks to the donor natural populations, including numerical reduction and selection effects, are therefore viewed by WDFW and NOAA Fisheries as subordinate to the need to expeditiously implement the supplementation program that will prevent extinction of the ESU (BAMP 1998). To preserve the remaining natural populations and to address the numerical reduction and selection effects, WDFW will implement the following measures:

- Broodstock removals will be limited within the region through designation of *nonintervention* areas where the supplementation program will not be applied. The designation of *non-intervention* areas will prevent numerical reduction impacts for some of the region's populations as a result of program operations;

- An upstream escapement of approximately 80 adults per population will be maintained as a minimum level for natural spawning for those areas where the supplementation program will be applied when escapement to Wells Dam is greater than 668 adults;

- Removal of adult broodstock at traps for the supplementation program shall be representative of the run-at-large with respect to migration timing, age class, morphology, and sex ratio. Selection effects on that portion of each fish population allowed to spawn naturally will be minimized through these measures;

- Allow natural production to continue concurrent with the Methow Basin supplementation program through passage of a interim program minimum of 296 adults upstream when the run size at Wells Dam is expected to be greater than 668. A long term program minimum of 40% of the total arriving run will be passed for future runs between 741 and 1,415 fish; and

- Allow natural production to continue concurrent with the Wenatchee Basin supplementation program by the use of the fish collection weirs on the Chiwawa River and Nason Creek to trap up to 90% of the run but to pass two of every three fish collected to spawn naturally.

To address the loss of genetic diversity among specific populations, WDFW proposes the following measures:

- Manage for the most discrete population units possible for supplementation. Critical criteria for choosing population units targeted for supplementation include the logistical limitations of terminal area collection and release for each population, the maintenance of genetic integrity and local adaptation, and the ability to manage for each discrete population. Discrete populations chosen for the supplementation program (Chiwawa River/Nason Creek, White River, Chewuch and Twisp River) represent major nominalspring chinook salmon populations in the Wenatchee and Methow River systems;

- Provide that a proportion of each population will not be subjected to artificial propagation and the associated potential risk of negative genetic effects, an upstream escapement goal of approximately 80 adults per population will be maintained as a minimum level for natural spawning;

- Limit the loss of diversity among populations within the region through the designation of *non-intervention* areas where the supplementation program will not be applied. These *non-intervention* areas will include the Little Wenatchee River and possibly the Entiat River, depending on the results of genetic sampling effort;

- Volitionally release hatchery spring chinook smolts after acclimation in the desired adult return location to minimize straying to other streams, reducing the risk of interbreeding between unrelated chinook populations and diversity loss among populations; and

- Assess and manage straying, and the potential for genetic diversity effects, through the marking of all hatchery spring chinook with a CWT and visual mark. Mass marking will allow for ready differentiation between hatchery and natural fish on spawning grounds.

USFWS will use broodstock collected by WDFW at Wells Dam, the Twisp trap, the Chewuch trap and/or the Methow SFH and returning hatchery adults that volunteer into the fish ladder at Winthrop NFH. If in-season broodstock collections are below broodstock needs, then USFWS may also collect adults in the outfall from the Methow SFH. During the transition to Methow composite stock, USFWS may retain all adult spring chinook that return to the Winthrop NFH, but may cull any known Carson-stock spring chinook. Currently a large proportion of the returning Carson-stock spring chinook are not differentially marked from the Methow composite stock and must be held and sorted at time of spawning. In the future, returning Carson-stock spring chinook, will be externally marked and can be sorted at time of return. All unmarked spring chinook adults not needed for broodstock will be released unharmed to the mainstem Methow River.

Ecological effects

a) Predation -

The Species Interaction Work Group (SIWG 1984) reported that there is an unknown level of risk of predation by hatchery smolts on listed fish juveniles where they interact in freshwater migrational areas. Although the risk to wild fish is unknown, the group noted that predation may be greatest when large numbers of hatchery smolts encounter newly emerged fry or fingerlings, or when hatchery fish are large relative to wild fish. Due to their location in the upper portions of the drainages and later time of emergence (late spring through August [MCMCP 1997]), wild steelhead fry are not likely to be vulnerable to predation by hatchery smolts. Smolts from the hatcheries are predominantly planted in mainstem river areas in April and May, which separates them spatially and temporally, to a significant degree, from newly-emerging steelhead fry. Witty et al. (1995) concluded that predation by hatchery production on wild salmonids does not significantly impact naturally-produced fish survival in the Columbia River migration corridor. Chinook salmon yearling smolts released from hatcheries may interact with one, two and three year old un-smolted natural steelhead that are rearing in the tributary and mainstem migration corridors. The Species Interaction Work Group (SIWG 1984) reported that there is an unknown risk of predation by hatchery chinook salmon on natural steelhead juveniles where they interact in freshwater migrational areas. Steward and Bjornn (1990) referenced a report from California that estimated, through indirect calculations rather than actual field sampling methods, the potential for significant predation impacts by hatchery yearling chinook salmon on natural chinook and steelhead fry. They also reference a study in British Columbia that reported no evidence of predation by hatchery chinook smolts on emigrating natural chinook fry in the Nicola River. Although rating the risk to natural fish as unknown, the SIWG (1984) noted that predation may be greatest when large numbers of hatchery smolts encounter newly emerged fry or fingerlings, or when hatchery fish are large relative to natural fish. There is the potential for predation on natural steelhead by hatchery chinook smolts, if the steelhead are of a small enough size. Chapman *et al.* (1994) reported a steelhead smolt size range at out migration of 6.3-6.9 inches (160-175 mm) FL in the Mid-Columbia Region. Naturally produced steelhead smolts sampled at Rock Island Dam averaged between 6.4-7.4 inches (163- 188 mm) FL for years 1986 through 1994 (Chapman *et al.* 1994). Assuming that non-smolted age 2 and 3 steelhead are within the range recorded for smolts (6.3-6.9 inches (160-175 mm FL)), predation by hatchery spring chinook smolts, which at release are of a size nearly equal to that of the natural steelhead, would be unlikely. Age 1 steelhead smolts have a mean FL of 6.1 inches (156 mm) at Rock Island Dam (1988-89 date from Peven *et al.* 1994). Age 1+ non-smolts may be of a size smaller than that recorded for smolts that age. However, it is unlikely that age 1+ natural steelhead non-smolts are less than 2.4 inches (60 mm) FL, which (assuming the 1/3 length "rule") would be vulnerable size for predation by hatchery salmon that are larger than 7.1 inches (180 mm) FL. Chapman *et al.* (1994) reported mean FL sizes of natural underyearling Wenatchee River steelhead of 2.8 inches to 3.1 inches (72 mm to 78 mm) in October. These natural fish would be larger as yearlings in April and May when hatchery smolts are

released. Spring chinook transition to a fish diet when they reach 4.7 inches (120 mm) FL or larger (BPA 1997a) and begin their seaward migration as yearling smolts. Muir and Emmett (1988) found chinook smolts actively feeding on invertebrate species such as cladocerans, chironomids and amphipods during their downstream migration. Larger smolts may eat smaller fish, but recent information indicates that fish are an insignificant fraction of the food consumed by migrating chinook salmon in the Snake and Columbia rivers (Muir and Coley 1995).

b) Competition -

Direct competition for food and space between hatchery and listed fish may occur in spawning and/or rearing areas, the migration corridor, and ocean habitat. These impacts are assumed to be greatest in the spawning and nursery areas and at points of highest fish density (release areas) and to diminish as hatchery smolts disperse (USFWS 1994). Competition continues to occur at some unknown, but probably lower, level as smolts move downstream through the migration corridor. Release of large numbers of pre-smolts in a small area is believed to have greater potential for competitive effects because of the extended period of interaction between hatchery fish and listed species. Release of hatchery smolts that are physiologically ready to migrate is expected to minimize competitive interactions because they are more likely to quickly migrate out of the spawning and nursery areas. At the short-term target production goals, the programs will produce up to 672,000 (Chiwawa/Nason supplementation programs) hatchery smolts for release into the Wenatchee River Basin and 1,150,000 into the Methow River Basin based on the expected survival of broodstock and progeny. Due to size variance of the population around the target release size of 15 fish/lb (30 grams/fish), only a portion (about 10%) of each year's release are not classified as true "smolts." Based on numerous snorkel observations made by WDFW, during volitional releases of spring chinook salmon into the Tucannon River, the hatchery smolts tended to migrate down river almost immediately. This observation is further supported by recaptures of hatchery-produced smolts at a downstream migrant trap, 33 miles below the release site. Smolt travel times of over 12.4 miles/day have been documented for several hatchery release locations within the Tucannon River drainage. Snorkel observations determined that naturally produced fish do not generally move from their preferred location, and are apparently not disturbed by the release of large numbers of hatchery fish (WDFW 1998b). Competition for space and cover in the Wenatchee and Methow Rivers probably occurs between hatchery and natural fish shortly after release and during downstream migration, but based on the smolt travel times the duration of interaction is minimal in the river (WDFW 1998a). Rearing and release strategies at all WDFW spring chinook hatcheries are designed to limit adverse ecological interactions through minimizing the duration of interaction between newly liberated hatchery chinook and naturally produced fish. WDFW and USFWS propose to minimize the amount of interactions between hatchery smolts and naturally produced spring chinook salmon through the following actions:

- Rear hatchery spring chinook to sufficient size such that smoltification occurs within nearly the entire population, reducing residence time in the streams after release (Bugert *et al.* 1991) and promoting rapid seaward migration. Physiological measures of the degree of smoltification within the hatchery population, including allowable fork length coefficient of variation maximums (CV less than 10 %) and average condition factor at release targets (0.9 – 1.0), will be used to indicate when fish should be allowed to volitionally migrate;
- Continue to release spring chinook smolts to benefit from water budget releases through upstream dams, to further accelerate seaward migration of released hatchery fish, further reducing the duration of any interactions with natural fish;
- Rear fish on-station using parent river water which will contribute to the smoltification process leading to reduced hatchery fish residence time in the rivers and mainstem migration corridors; and

- Liberate hatchery spring chinook smolts, after acclimation, in the desired adult return location to minimize the risk of straying to other streams, thereby reducing the risk of adverse competitive effects with indigenous natural fish for spawning sites or mates.

c) Behavioral effects -

High fish densities resulting from hatchery releases may cause displacement of rearing wild steelhead juveniles from jointly-occupied stream areas, leading to abandonment of advantageous feeding areas, or premature outmigration by wild juvenile steelhead. Pearsons et al. (1994) reported displacement of juvenile wild rainbow trout from discrete sections of streams by hatchery steelhead released into an upper Yakima River tributary. No large scale displacements of trout were detected. Small scale displacements and agonistic interactions that were observed between hatchery steelhead and wild trout resulted from the larger size of hatchery steelhead, which behaviorally dominated most contests. They noted that these behavioral interactions did not appear to significantly impact the trout populations examined, and the population abundance of wild salmonids did not appear to be negatively affected by releases of hatchery steelhead. Release of only smolts from the hatchery programs will minimize temporal overlap between hatchery-released fish and juvenile wild steelhead in the individual rivers and in the Columbia River mainstem. The outplanting of only volitionally-migrating smolts by the hatcheries will help decrease density-dependent effects on wild fish, such as niche displacement and "pulling", leading to premature migration. Releases of hatchery smolts coincident with managed releases of water from dams (water budget releases) will help accelerate downstream migration of hatchery released salmonids, further reducing spatial and temporal overlaps with wild fish.

d) Disease transmission -

Although hatchery populations can be reservoirs for disease pathogens because of their elevated exposure to high rearing densities and stress, there is little evidence to suggest that diseases are routinely transmitted from hatchery to natural fish (Steward and Bjornn 1990). Chapman *et al.* (1994) concluded that disease transmittal from hatchery to natural populations is probably not a major factor negatively affecting natural steelhead in the Columbia Basin. To address concerns of potential disease transmission from hatchery to natural fish, the Pacific Northwest Fish Health Protection Committee (PNFHPC) has established guidelines to ensure hatchery fish are released in good condition, thus minimizing impacts to natural fish (PNFHPC 1989). Also, the IHOT (1995) developed detailed hatchery practices and operations designed to prevent the introduction and/or spread of any fish diseases with the Columbia River Basin. Hatcheries in the Columbia River Basin generally follow fish health protocols in accordance with PNFHPC and IHOT recommended guidelines. WDFW has implemented both disease prevention and disease control programs to maximize production of healthy fish. Adult broodstock are injected with Food and Drug Administration (FDA) approved antibiotics under the control of a certified Fish Pathologist, for treatment of BKD prior to transportation and during spawning. Spawned adults are evaluated for the presence of viral and bacterial pathogens following accepted standard procedures set forth by the Pacific Northwest Fish Health Protection Committee (PNFHPC 1989).

Residualism

Hatchery salmonids that do not emigrate after release, are said to have residualized. These fish that residualize can adversely effect naturally produced fish through competition and predation. Chinook salmon do not tend to residualize (Groot and Margolis 1991), thus no effects are expected on natural UCR spring chinook salmon or steelhead in the Wenatchee River or Methow River basins.

Migration Corridor/Ocean

Dawley et al. (1986) reported that movement rates of salmonids through the estuary and into the ocean are higher than observed migration rates from release sites to the estuary. They reported that this finding generally indicates that the use of the Columbia River estuary by juvenile salmonids originating from upstream areas is limited in duration compared to that of other west coast estuaries. Chapman et al. (1994) also reported that smolts move rapidly through the Columbia estuary. The minimal overlap of hatchery and wild salmon in the estuary reduces the likelihood for adverse effects through competition, predation, or disease transmission. In evaluating the potential impacts due to competition, Witty et al. (1995) determined that increasing the number of hatchery steelhead in or just upstream of the estuary is unlikely to affect natural populations of anadromous fish. On-station release of only smolts through volitional release practices and size, size variation, and time at release criteria from the lower river hatcheries is believed to reduce the duration of estuarine residence, thereby minimizing adverse effects on wild steelhead rearing or migrating through the area.

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).

During the trapping of spring chinook salmon broodstock at Wells Dam, there is the potential for endangered UCR summer steelhead to be present. At Wells Dam, UCR summer steelhead tend to move through the east ladder and not the west ladder. In recent years only 1 steelhead was handled in the west ladder and up to 89 steelhead were handled in the east ladder during spring chinook salmon broodstock collection. Trapping spring chinook salmon in the east ladder only occurs when returns to Wells Dam are expected to be below 668 adults. Thus, when returns are greater than 668, the handling of ESA-listed summer steelhead will be greatly reduced because trapping will only occur in the west ladder fish trap. The total number of steelhead handled may increase as returns of ESA-listed steelhead increase in the future. No ESA-listed steelhead are handled at the other adult collection sites due to the steelhead returning after the broodstock collection period. However, there is the potential for up to 20 listed steelhead that volunteer into the trap at Winthrop NFH to be handled during broodstock collection activities. Steelhead that are handled during broodstock collection will be released unharmed into the Methow River. The potential handling of up to 100 adult, endangered, UCR summer steelhead during the collection of adult spring chinook salmon at Wells Dam is not expected to result in more than 9 mortalities of listed steelhead because collection occurs early in the run when few fish are present and the water temperatures are colder. Cold water temperatures increases the ability of salmonids to survive handling and release without harm. Fish will be sorted daily to reduce delay and handling will be kept to a minimum. Even with these measures the nine mortalities assumes a 5% mortality rate from handling and includes a buffer if steelhead returns increase to the point where more than 100 are handled at Wells Dam and other locations in the action area. The expected handling of up to 100 endangered summer steelhead is only 2.5 percent of the recent 5- year average passage for UCR steelhead at Wells Dam.

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 additional mortality from this operation that deviates from permit conditions or take levels would be communicated to NOAA Fisheries per permit conditions (#1196).

Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.
Annual Progress Reports as a condition of Section 10 permit compliance are provided from WDFW to NOAA Fisheries for past takes associated with the Section 10 permit (#1196).

Section 3: Relationship of Program to Other Management Objectives

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

The spring chinook artificial propagation activities of this program are included within the MCHCP, a conservation planning initiative in the mid-Columbia River Basin designed to bolster the productivity of salmonid populations in a manner that is compatible with self-sustaining populations. The MCHCP includes approaches for hatchery production that will contribute to the rebuilding and recovery of naturally spawning stocks throughout the Mid-Columbia region to the point that those stocks can be self-sustaining, supporting harvest, while maintaining genetic and ecologic integrity (MCHCP 1998). A Biological Assessment and Management Plan (BAMP) has been assembled as a part of the MCHCP that describes approaches to be applied within the region under a Mid-Columbia River Hatchery Program. This program is a consensus plan by fish co-managers for development, operation, and evaluation of anadromous salmonid hatcheries in the Columbia River upstream of the Yakima River confluence (BAMP 1998). The co-managers include National Marine Fisheries Service (NMFS), U. S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, Yakama Indian Nation, Colville Confederated Tribes, the Confederated Umatilla Tribes, and Chelan, Douglas, and Grant Public Utility Districts (PUDs).

In addition to maintaining consistency with the MCHCP hatchery plan, allowable annual spring chinook production levels must also be consistent with ESA protective requirements for other ESA-listed salmonid species in the Columbia River Basin, fulfillment of federal treaty obligations to Native Americans, fulfillment of court approved actions developed under the auspices of United States v. Oregon, the discharge of fisheries mitigation responsibilities incurred as a result of water development authorizations, and achievement of U.S./Canada Pacific Salmon Treaty obligations (CBFWA 1996). Production levels described in this application will also be compatible with allowable levels defined through the basin-wide annual production ceiling set by [NMFS (NMFS 1995). Existing policies affecting hatchery operation and maintenance protocols in the Columbia River Basin are detailed in the 1994 Integrated Hatchery Operations Team (IHOT) Annual Report (IHOT 1995). The IHOT protocols are intended to address fish health practices, genetic effects, ecological interactions, fish cultural practices, and hatchery operations (IHOT 1995).

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

- The Columbia River Fish Management Plan (CRFMP)
- *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 (WDFW) Wild Salmonid Policy
- WDFW's Yearly Future Brood Document (FBD)

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 hatchery program is part of an application for the 50-year multi-species MCMCP and relicensing agreement for the PUDs. The plan has two objectives: (1) to help recover natural populations throughout the Mid-Columbia Region so that they can be self-sustaining and harvestable, while maintaining their genetic and ecologic integrity; and (2) to compensate for a 7% mortality rate at each of the five PUD-owned mid-Columbia River mainstem dams (Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids) in a manner that is consistent with the first objective. The first objective (recover populations that are at risk of extinction) takes precedence, and will guide the strategies used in the initial years of the hatchery program. Once it appears that populations have recovered, and if it can be done in a manner that will not jeopardize them, hatchery production of these populations will increase to meet the second objective (compensation for hydropower-related mortalities).

Hatchery production programs in the upper Columbia sub-basins are included in the management plans created by the fishery co-managers identified in the treaty fishing rights case *United States v Oregon*. The parties to *U.S. v Oregon* include the four Columbia River Treaty Tribes – Yakama Nation, Warm Springs, Umatilla, and Nez Perce tribes, NOAA-Fisheries, U.S. Fish and Wildlife Service, and the states of Oregon, Washington, and Idaho. The Shoshone-Bannock Tribe is admitted as a party for purposes of production and harvest in the upper Snake River only. These parties jointly develop harvest sharing and hatchery management plans that are entered as orders of the court that are binding on the parties. The "relevant co-managers" described in the *U.S. v Orego*n management plans are, for the mid-Columbia sub-basins, the federal parties, Yakama Nation, and Washington Department of Fish and Wildlife. In 1988, under the authority of U.S. v. Oregon, the states of Washington, Oregon and Idaho, federal fishery agencies, and the treaty tribes agreed to the Columbia River Fish Management Plan (CRFMP), which was a detailed harvest and fish production process. There are no financial encumbrances tied to the process. Rather, the fish production section reflects current production levels for harvest management and recovery purposes, since up to 90% of the Columbia River harvest occurs on artificially produced fish. This Plan expired in 1998, and has had subsequent annual rollover of portions in which agreement has been reached. However, a newly negotiated CRFMP is forthcoming.

In April 2002, negotiations on three Habitat Conservation Plans (HCPs) were concluded pursuant to section 10(a)(1)(B) of the ESA; *Anadromous Fish Agreement and Habitat Conservation Plan Wells Hydroelectric Project FERC1 License No. 2149* with Douglas PUD for the operation of Wells Dam (DPUD 2002), and *Anadromous Fish Agreement and Habitat Conservation Plan Rocky Reach Hydroelectric Project FERC License No. 2145* (CPUD 2002a) with Chelan PUD for the operation of Rocky Reach Dam, and *Anadromous Fish Agreement and Habitat Conservation Plan Rock Island Hydroelectric Project FERC License No. 943* with Chelan PUD for the operation of Rock Island Dam (CPUD 2002b). Biological Opinions with incidental take statements (ITSs) on the operation of each of the above hydroprojects have been issued consistent with the HCPs (NMFS 2003a, 2003b, 2003c). The amended permit #1196 adds Chelan and Douglas PUDs to the permit as joint permit holders with WDFW in accordance with the three Habitat Conservation Plan (HCP) agreements reached between the PUDs, NOAA Fisheries, USFWS and the Confederated Tribes of the Colville Reservation.

The supplementation program, and the HGMP describing it, are consistent with the following agreements or plans:

- The Mid-Columbia Mainstem Conservation Plan - Hatchery Plan (BAMP 1998).

- The Rock Island Settlement Agreement (RISA 1989) between Chelan Public Utilities District, their power purchasers, and the joint fishery parties represented by Washington Department of fish and Wildlife and other state and federal fishery agencies and tribes.
- The Wells Settlement Agreement between Douglas PUD, their power purchasers, and the joint fishery parties represented by Washington Department of fish and Wildlife and other state and federal fishery agencies and tribes.
- The Rocky Reach Mitigation Agreement between the joint fishery parties and Chelan PUD, as modified in the late-1980s.

3.3 Relationship to harvest objectives.

The objective of this program is recovery and enhancement of a listed upper Columbia River Spring Chinook stock (Chiwawa Spring Chinook), and harvest objectives are not currently set forth since stock is depressed and in recovery phase. The MCHCP hatchery plan states that allowable annual spring chinook production levels must also be consistent with ESA protective requirements for other ESA-listed salmonid species in the Columbia River Basin, fulfillment of federal treaty obligations to Native Americans, fulfillment of court approved actions developed under the auspices of United States v. Oregon, the discharge of fisheries mitigation responsibilities incurred as a result of water development authorizations, and achievement of U.S./Canada Pacific Salmon Treaty obligations (CBFWA 1996).

Fisheries in the UCR basin are currently limited by the need to protect ESA-listed UCR spring chinook salmon and UCR steelhead. Fisheries in the migration corridor and ocean are also limited to protect these populations, and to minimize harvest impacts on other listed salmon and steelhead returning to other Columbia River basin and Snake River basin areas. NMFS evaluates and authorizes annual fisheries proposed by the co-managers in the action area each year through separate section 7 biological opinions. The WDFW and the Yakama Nation promulgated fisheries in Icicle Creek in 2000 to harvest surplus unlisted spring chinook salmon adults originating from Leavenworth NFH through separate section 7 consultations. These fisheries occurred in May near the Leavenworth NFH dam and in lower Icicle Creek. Icicle Creek fisheries for Leavenworth NFH are expected to continue in subsequent years. Impacts on listed spring chinook salmon are expected to be insubstantial in these hatchery-fish directed harvests, as the Icicle Creek return area is isolated from listed fish production areas in the Wenatchee River basin. Current, low external marking levels for Leavenworth NFH spring chinook salmon allowing for their differentiation from listed spring chinook hampers the ability to harvest returning adult fish in other regional areas. Proposed increased external marking proportions may increase opportunities for the beneficial use of returning Leavenworth NFH spring chinook salmon in fisheries. The new Yakama Nation coho salmon reintroduction program is currently experimental, and will not lead to substantial numbers of adult returns that might be targeted for harvest for the term of this Opinion.

Until the spring of 2000 – when a relatively large run of hatchery spring chinook salmon returned and provided a small commercial Tribal fishery – no commercial season for spring chinook salmon had taken place since 1977. Present Columbia River harvest rates are very low compared with those from the late 1930s through the 1960s (NMFS 1991). Though steelhead – UCR steelhead included – were never as important a component of the Columbia basin's fisheries as chinook, net-based fisheries generally do not discriminate among species, so it can fairly be said that harvest has also contributed to the UCR steelhead declines. Salmonids' capacity to produce more adults than are needed for spawning offers the potential for sustainable harvest of naturally produced (versus hatchery-produced) fish. This potential can be realized only if two basic management requirements are met: (1) enough adults return to spawn and perpetuate the run, and (2) the productive capacity of the habitat is maintained. Catches may fluctuate in response to such variables as ocean productivity cycles, periods of drought, and natural disturbance events, but as long as the two management

requirements are met, fishing can be sustained indefinitely. Unfortunately, both prerequisites for sustainable harvest have been violated routinely in the past. The lack of coordinated management across jurisdictions, combined with competitive economic pressures to increase catches or to sustain them in periods of lower production, resulted in harvests that were too high and escapements that were too low.

Harvest actions outside the action area, such as in the ocean, mainstem Columbia River and other basin areas will be managed through the *U.S. v Oregon* and Pacific Fisheries Management Council (PFMC) planning and management processes, with guidance from NMFS. Proposed releases of spring chinook salmon, summer chinook salmon, sockeye salmon, and coho salmon juveniles into the UCR basin are not expected to create any substantial harvest complications with listed species. NMFS involvement with the co-managers in the PFMC and *U.S. v Oregon* fishery planning processes will adequately limit harvest effects on listed salmon and steelhead. Proposals for future fisheries will continue to be addressed by NMFS through separate section 7 consultation processes (Application for Permit #1347, *Incidental Take of Listed Salmon and Steelhead from Washington Department of Fish and Wildlife Hatchery Program, December 15, 1999).*

3.4 Relationship to habitat protection and recovery strategies.

WDFW is a cooperating agency involved in regional fish and wildlife planning and technical assistance effort through the Upper Columbia Salmon Recovery Board (UCSRB). The mission of the UCSRB is to restore viable and sustainable populations of salmon, steelhead, and other at-risk species through the collaborative, economically sensitive efforts, combined resources, and wise resource management of the Upper Columbia Region. Along with Chelan, Douglas, and Okanogan counties, the Yakama Nation, and Colville Confederated Tribe, local, state, and federal partners, agency staff will be working closely in partnership with existing planning efforts in the region including Wenatchee Watershed Planning, Entiat Watershed Planning, Lead Entities, Regional Fisheries Enhancement Group, and Salmon Recovery Planning.

Six fish and wildlife plans (also known as "subbasin plans") have been developed for the following "subbasins" (commonly known as watersheds): Wenatchee, Entiat, Lake Chelan, Methow, Okanogan, and the mainstem Columbia River from Rock Island dam to the Canadian border. Subbasin plans and have been submitted to the Northwest Power Planning Council in May 2004. These subbasin plans will identify and provide the basis for prioritizing project proposals to be submitted to the Northwest Power Planning Council in future funding cycles and will be used, potentially, for salmon recovery planning in North Central Washington.

WDFW helps ensures that actions taken to protect and restore salmonid habitat in the region are based on sound scientific principles thru technical assistance of Regional staff. In addition to habitat, WDFW is involved with the Yakama Nation and Colville Confederated Tribes in helping develop recovery goals, and providing coordination and representation for all 4 H's (Harvest, Hydro, Hatcheries and Habitat). At the watershed scale, technical tools such as Limiting Factors Analysis (LFA), Ecosystem Diagnosis and Treatment (EDT) and SSHIAP (Salmon and Steelhead Inventory and Assessment Program) will used to identify factors that currently impact salmon and the priority actions needed in the watershed.

3.5 Ecological interactions.

Salmonid and non-salmonid fishes or other species that could:

(1) negatively impact program;
Spring chinook smolts are released in the spring as either yearlings or sub-yearlings. Competition for food may play a role in the mortality of liberated chinook. SIWG (1984) indicated that there is a high risk that competition between hatchery-origin chinook, and coho, steelhead and other chinook

stocks, will have a negative impact on the productivity of the hatchery fish. Predation in freshwater areas also may limit the productivity of the summer chinook releases. In particular, predation by northern pike minnow poses a high risk of significant negative impact on productivity of enhanced chinook (SIWG 1984). Predation risks to hatchery chinook juveniles posed by coho, steelhead, and other chinook stocks are unknown (SIWG 1984). Hatchery-reared salmon and steelhead released into spawning and rearing areas of natural species may fail to emigrate (residualize), and may negatively interact with natural fish. Steelhead residualism has been found to vary greatly, but is thought to average between 5% and 10% of the number of fish released (USFWS 1994). Because of their larger size, the predation risk posed by the above species is lower to yearling smolts released from the hatcheries (Rieman et al. 1991).

(2) be negatively impacted by program;
SIWG (1984) reported that there is a high risk that enhanced chinook salmon populations would negatively affect the productivity of wild chum and sockeye in freshwater and during early marine residence through predation. The risk of negative effects to wild fish posed by hatchery chinook through competition is low or unknown in freshwater and marine areas (SIWG 1984). Large concentrations of migrating hatchery fish may attract predators (birds, fish, and seals) and consequently contribute indirectly to predation of listed wild fish (Steward and Bjornn 1990). The presence of large numbers of hatchery fish may also alter wild salmonid behavioral patterns, potentially influencing their vulnerability and susceptibility to predation.

(3) positively impact program;
Increased numbers of chinook and other salmonid species that escape to spawn in upper Columbia River tributaries may contribute nutrients to the system upon dying that would benefit spring chinook productivity.

(4) be positively impacted by program.
Spring chinook juveniles released through the WDFW programs may benefit co-occurring salmonid populations. A mass of hatchery fish migrating through an area may overwhelm established predator populations, providing a beneficial, protective effect to co-occurring wild fish. Increased numbers of hatchery-origin summer chinook that are allowed to spawn naturally may contribute nutrients to the system upon dying that would benefit the productivity of other salmonid species.

Section 4. Water Source

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

Fish are transferred during the fall have been reared on well water. Summer temperatures at Chiwawa range from 63º F - 59º F during the summer but are cooling rapidly as fall approaches. If the transfers are delayed too long, Chiwawa River water cools to levels less than at Eastbank Hatchery. If delayed during the fall, the following limitations of this temperature difference can occur: The BY 2001 Chiwawa River spring chinook were transferred from Eastbank FH to Chiwawa River Acclimation site between 21-24 October 2002, approximately three weeks later than prescribed transfer date. The transfer date was later than normal due to delays in necessary equipment repairs at the Chiwawa facility (backup generator). When the fish arrived at the acclimation site they were initially acclimated to Wenatchee River water that was approximately 9^0F colder than the well water source at Eastbank Fish hatchery. Several days later (26 October) they were shifted to Chiwawa River surface water that was approximately 15^0F colder than the Wenatchee River water. The fish remained on Chiwawa River water for approximately 4 days, during which time the Chiwawa River water temperature declined to a point where frazzle ice began to develop (32^0F), at which time the rearing water source was shifted back to 47^0F Wenatchee River water. The shift back to Wenatchee River water resulted in a temperature differential of 15^0F. Each temperature fluctuation occurred within approximately two hours duration. The shift in rearing water sources effectively maintained the rearing water source, but resulted in rapid and significant water temperature fluctuations.

It is likely that the dynamic water temperature regime compromised fish immune systems, providing the opportunity for fungus spore sources to develop into an epizootic mortality event. Future rearing and acclimation procedures should avoid rapid and significant water temperature fluctuations associated with multiple surface water sources. All morbid fish removed as a result of this mortality event were enumerated and buried on-site.

Through the winter months, Chiwawa River water is pumped to the rearing ponds but during January range from 36º - 34ºF and result in frazzle ice conditions, the water source is switched to warmer Wenatchee River water which at 39º F prevents the problems.

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.

Adverse impacts on listed fish due to the operation of hatchery facilities for the propagation of unlisted species may occur because of river water intake placement, or design, or operation including blocked migration, de-watering river reaches or reduced stream flow, and entrainment from unscreened or improperly screened intakes. Effluent from hatchery facilities may decrease quality through changes in water temperature, pH, suspended solids, ammonia, organic nitrogen, total phosphorus, and chemical oxygen demand in the receiving streams mixing zone (Kendra 1991).

Water withdrawal for use in hatcheries is monitored through the Washington State Department of Ecology and the Washington State chapter 90.03 Revised Code of Washington (RCW) water code. None of the hatchery facilities employed to carry out the proposed artificial propagation programs de-water river reaches used by listed fish for migration, spawning, or rearing. In the Wenatchee River basin, all of the water intake systems at hatchery facilities that have surface water intakes are screened in compliance with NMFS screening criteria (NMFS 1996), except for the USFWS' Leavenworth NFH (Biological

Opinion for Permit 1347). Water intakes into artificial propagation facilities shall be screened in compliance with 1995 NMFS screening criteria and as per the 1996 addendum to those criteria (NMFS 1996). As an alternative, they will comply with transitional criteria set forth by NMFS in 2000 for juvenile fish screens constructed prior to the establishment of the 1995 criteria, to minimize risks to listed salmon and steelhead. WDFW shall inspect and monitor the water intake screen structures at their hatchery facilities to determine if listed salmon and steelhead are being drawn into the facility.

All WDFW hatcheries monitor their discharge in accordance with the National Pollutant Discharge Elimination System (NPDES) permit. This permit is administered in Washington by the Washington Department of Ecology under agreement with the United States Environmental Protection Agency. The permit was renewed effective June 1, 2000 and will expire June 1, 2005. Hatchery wastewater discharge is monitored monthly at each of the steelhead production facilities in the Upper Columbia basin. The WDFW facilities include Eastbank Hatchery, Wells Hatchery, Chiwawa Ponds, Chelan Hatchery and Turtle Rock Hatchery. No violations of the National Pollutant Discharge Elimination System (NPDES) permit limits occurred during the reporting period June 1, 2002 through May 31, 2003.

Facilities are exempted from sampling during any month that pounds of fish on hand fall below 20,000 lbs and pounds of feed used fall below 5,000 lbs, with the exception of offline settling basin discharges which are to be monitored once per month when ponds are in use and discharging to receiving waters.

Sampling at permitted facilities includes the following parameters:

- FLOW — Measured in millions of gallons per day (MGD) discharge.
- SS EFF — Average net settleable solids in the hatchery effluent, measured in ml/L.
- TSS COMP — Average net total suspended solids, composite sample (6 x/day) of the hatchery effluent, measured in mg/L.
- TSS MAX — Maximum daily net total suspended solids, composite sample (6 x/day) of the hatchery effluent, measured in mg/L.
- SS PA — Maximum settleable solids discharge from the pollution abatement pond, measured in ml/L.
- SS % — Removal of settleable solids within the pollution abatement pond from inlet to outlet, measured as a percent. No longer required under permit effective June 1, 2000.
- TSS PA — Maximum total suspended solids effluent grab from the pollution abatement pond discharge, measured in mg/L.
- TSS % — Removal of suspended solids within the pollution abatement pond from inlet to outlet, measured as a percent. No longer required under permit effective June 1, 2000.
- SS DD — Settleable solids discharged during drawdown for fish release. One sample per pond drawdown, measured in ml/L.
- TRC — Total residual chlorine discharge after rearing vessel disinfection and after neutralization with sodium thiosulfate. One sample per disinfection, measured in ug/L.

In addition, at Similkameen Hatchery only, the following sampling was conducted at the request of WA Dept of Ecology, but is not required under NPDES permit:

- SS IW — Settleable solids influent grab taken as wastes are pumped into the pollution abatement pond, measured in mg/L.

- TSS IW — Total suspended solids influent grab as wastes are pumped into the pollution abatement pond, measured in mg/L.

Section 5. Facilities

5.1 Broodstock collection facilities (or methods).

Ponds (number)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
2	Concrete Ponds (Partitioned with Screen)	7500	100	15	5	900
1	V-Type Trap/Weir with Holding Box (Chiwawa River)					
1	Tumwater Adult Holding Pond (Tumwater Trap/Weir Facility)	4000	10	50	8	U

Adult spring chinook broodstock are trapped and collected on the lower Chiwawa River (RKm 2.0) and at the Tumwater Dam on the Wenatchee River (RKm 52.0). The Chiwawa River trap/weir, the primary broodstock collection site, retains no more than 30% of the naturally produced adults returning to the river, and maintains a minimum of 33% of the broodstock as naturally-produced adults. The Tumwater Dam trap is a secondary broodstock collection site, and is operated when runs are diminishes to augment numbers of fish collected at the Chiwawa location. Only marked Chiwawa hatchery-origin chinook are collected at Tumwater Dam for inclusion as broodstock in the program. Adults are transported to the Eastbank Hatchery for holding and maturation.

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

Equip. Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Flatbed Truck with Tank (adult hauling)	250	Y	N	45	MS 220 and NaCl	10 ppm (MS 220) and 0.5-1.0% (NaCl)
Tanker Truck	2500	Y	N	60	MS 220 and NaCl	5-1.0% (NaCl)

5.3 Broodstock holding and spawning facilities.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
2	Concrete Ponds (Partitioned with Screen)	7500	100	15	5	900
1	V-Type Trap/Weir with Holding Box (Chiwawa River)					
1	Tumwater Adult Holding Pond (Tumwater Trap/Weir Facility)	4000	10	50	8	U

5.4 Incubation facilities.

Incubator Type	Units (number)	Flow (gpm)	Volume (cu.ft.)	Loading-Eyeing (eggs/unit)	Loading-Hatching (eggs/unit)
Heath Stacked Tray (104 half stacks with 7 trays per Stack)	728	3-4		6,00 (1 female/tray)	6500

5.5 Rearing facilities.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Density Index
1	Concrete Standard Raceways	3760	100	10	3.76	900	0.125
2	Super Raceways	22200	180	20	6.2	3500	0.125
2	Acclimation Ponds- Chiwawa Satellite Facility	37500	150	50	5.0	2700	0.125

Satellite acclimation facilities are associated with the Rock Island Dam Complex (Chiwawa River Acclimation Pond).

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
2	Acclimation Ponds- Chiwawa Satellite Facility	37500	150	50	5.0	2700	-	0.125

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

Frazzle ice conditions at Chiwawa Ponds occurs during the winter months necessitating operational switch to water pumped from the Wenatchee River. Imprinting of fish to the Chiwawa River can be compromised because of this operational necessity.

The BY 2001 Chiwawa River spring chinook were transferred from Eastbank FH to Chiwawa River Acclimation site between 21-24 October 2002, approximately three weeks later than prescribed transfer date. The transfer date was later than normal due to delays in necessary equipment repairs at the Chiwawa facility (backup generator). When the fish arrived at the acclimation site they were initially acclimated to Wenatchee River water that was approximately 9^0F colder than the well water source at Eastbank Fish hatchery. Several days later (26 October) they were shifted to Chiwawa River surface water that was approximately 15^0F colder than the Wenatchee River water. The fish remained on Chiwawa River water for approximately 4 days, during which time the Chiwawa River water temperature declined to a point where frazzle ice began to develop (32^0F), at which time the rearing water source was shifted back to 47^0F Wenatchee River water. The shift back to Wenatchee River water resulted in a temperature differential of 15^0F. Each temperature fluctuation occurred within approximately two hours duration. The shift in rearing water sources effectively maintained the rearing water source, but resulted in rapid and significant water temperature fluctuations.

Chiwawa River spring chinook 2001 brood suffered substantial mortality at the Chiwawa River Acclimation Pond during November and December 2002. Approximately 749,306 juvenile spring chinook were transferred to the Chiwawa Acclimation Pond during late October 2002. Mortality increased beginning 30 October 2002 as a result of an external fungus outbreak. Formalin treatments began immediately in an attempt to control the fungus. Even with formalin treatments, mortality was estimated at approximately 43%. The causative factor to the fungus outbreak is unknown, however, it may be associated with compromised fish immune systems due to rapid and significant variations in rearing water temperatures associated with multiple rearing water sources (Eastbank FH, Chiwawa River and Wenatchee River).

It is likely that the dynamic water temperature regime compromised fish immune systems, providing the opportunity for fungus spore sources to develop into an epizootic mortality event. Future rearing and acclimation procedures should avoid rapid and significant water temperature fluctuations associated with multiple surface water sources. All morbid fish removed as a result of this mortality event were enumerated and buried on-site.

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.

Fish are reared in multiple facilities or with redundant systems to reduce the risk of catastrophic loss. The facility is sited so as to minimize the risk of catastrophic fish loss from flooding. Water flow alarms monitor flow with back-up portable pumps available for short term useage. Staff either resides on-station or the facilities are continuously staffed to assure the security of fish stocks on-site. The programs implement the "Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State" (NWIFC and WDFW 1998) and Pacific Northwest Fish health Protection Committee (PNFHPC 1989) guidelines to minimize the risk of fish disease amplification and transfer, and to ensure that artificially propagated fish would be released in good health.

To prevent catastrophic mortality or to reduce the preponderance of chronic disease, variance from the smolts only release requirement may be pursued after agreement of the HCP Hatchery Committees and NMFS. Conditions such as flooding, water loss to raceways, or vandalism may warrant early release into appropriate environments after review by the HCP Committee and NMFS. Any emergency release of UCR spring chinook salmon would be reported immediately to the NMFS Salmon Recovery Divison in Portland, Oregon.

Flow reductions, flooding and poor fish culture practices may all cause hatchery facility failure or the catastrophic loss of listed fish under propagation. To protect endangered spring chinook, all efforts should be made to ensure that the survival of adult spring chinook held for broodstock at the hatchery facility be maximized. WDFW and USFWS propose a variety of measures to address risks associated with operational failures, including:

- Staffing hatchery facilities and fish weirs full time during their operation, providing for the protection of fish from vandalism and predation, and allowing for rapid response in the event of power and water loss or freezing;
- Equipping hatchery facilities with back-up generators to provide an alternative source of power to supply water to rearing fish during power outages;
- Rearing juveniles at lower pond loading densities to minimize the risk of loss due to disease at all facilities where spring chinook are held; and
- Ensuring staff are adequately trained in proper fish handling, rearing, and biological sampling techniques, and that all activities will be conducted in accordance with the WDFW Fish Health Manual (WDFW 1996) and/or Pacific Northwest Fish Health Protection Committee (PNFHPC 1989) disease prevention and control standards.

Section 6. Broodstock Origin and Identity

6.1 Source.

Adult spring chinook broodstock are trapped and collected on the lower Chiwawa River (RKm 2.0) and at the Tumwater Dam on the Wenatchee River (RKm 52.0). The Chiwawa River trap/weir, the primary broodstock collection site, retains no more than 30% of the naturally produced adults returning to the river, and maintains a minimum of 33% of the broodstock as naturally-produced adults. The Tumwater Dam trap is a secondary broodstock collection site, and is operated when runs are diminishes to augment numbers of fish collected at the Chiwawa location. Only marked Chiwawa hatchery-origin chinook are collected at Tumwater Dam for inclusion as broodstock in the program.

6.2.1 History.

Broodstock Source	Origin	Year(s) Used	
		Begin	End
Chiwawa River Spring Chinook	N	1989	U
Chiwawa River Spring Chinook- Supplementation Fish	H	1993	U

6.2.2 Annual size.

Between the Chiwawa and Wenatchee trapping locations, a total of up to 400 adults can be collected in order to produce a maximum of 672,000 smolts for the program. On a given year, the program numbers are dependent on sufficient wild fish in order to maintain a 1:2 ratio of wild to hatchery origin fish in the broodstock. Of the combined total number of spring chinook salmon adults and jacks that return to the Chiwawa River and Nason Creek each year, WDFW may retain no more than 400 or one-third, whichever is less, for broodstock to meet the longterm smolt production goals of the program.

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

The original broodstock collection strategy for the Chiwawa spring chinook was to retain no more than 33~~0~~% of the naturally produced adults returning to the river, and pass all hatchery-origin fish upstream. Since 1995, hatchery fish have also been collected for broodstock. Protocols for each year's adult collection are developed in the year of return, and use the predicted run strength as the primary factor in their development with the program, recovery broodstock collection objective set at 1:2 ratio of wild to hatchery origin fish in the broodstock. In 2003, of the 119 chinook retained, 52 were adipose present (wild origin), the remaining were adipose absent (hatchery origin). The observed origin composition within the retained broodstock provided a 1:2 ratio of wild to hatchery origin, meeting the broodstock collection objective. Crosses are prioritized to maximize HxW progeny.

6.2.4 Genetic or ecological differences.

The broodstock chosen displays morphological and life history traits similar to the natural population. The draft adult broodstock collection protocols are keyed on target numbers at various collection sites operated by WDFW that provide broodstock for Mid-Columbia PUD mitigation program facilities. Adult broodstock collection protocols are to be considered an interim and dynamic hatchery broodstock collection plan, which may be altered following joint fishery party

(JFP) discussions. As such, there may be significant in-season changes in broodstock numbers, locations, or collection times, brought about through continuing co-manager consultation and in-season monitoring of the anadromous fish runs to the Columbia River above Priest Rapids Dam.

Depending on the TAC forecast for upper Columbia River spring chinook, collection protocols will target specific populations of fish in the Methow Basin through broodstock collections in tributary locations rather than collections at Wells Dam. Broodstock collection protocols for Wenatchee River spring chinook, Wenatchee River Basin summer chinook, and Methow/Okanogan summer chinook will target an increased proportion of wild origin fish for inclusion in the broodstock.

White River spring chinook have been determined to be a genetically unique stock and shall be managed as a separate stock. A proposal to collect spring chinook at Tumwater Dam and use DNA analysis to segregate fish by stock is under development. If we are able to determine the origin of fish using the DNA technology with a high level of confidence, we can then selectively retain Chiwawa and Nason origin fish. Fish identified from the White River would be released and allowed to spawn naturally. Nason Creek Captive Broodstock gametes may be incorporated into the Chiwawa/Nason adult supplementation program. If Nason Creek Captive Brood progeny are to be reared at Eastbank FH, and will exceed 672,000 smolts in combination with the Chiwawa River supplementation production, then the broodstock collection must be reduced accordingly.

[UU1]Broodstock collection in Nason Creek is an important element toward collecting sufficient adults for broodstock that will supplement the Chiwawa River and Nason Creek populations. Since 1993, an estimated 25% of all Chiwawa spring chinook recovered on the spawning grounds were found in Nason Creek. With this degree of straying, the current program is essentially mining the Chiwawa River spring chinook and supplementing Nason Creek. To partially address the straying of Chiwawa River hatchery origin fish, trapping at Tumwater Dam will be the focus of the hatchery origin portion of the broodstock collection. Infusion of wild origin stock into the Chiwawa River supplementation program (Chiwawa River and Nason Creek Composite populations) is also an important element to the success of recovery of the Wenatchee River spring chinook ESU and will be an additional focus element in the broodstock collection in the future.

6.2.5 Reasons for choosing.

Broodstock is collected from endemic spring chinook population of the Wenatchee subbasin. This population of spring chinook is currently vulnerable harvest by downstream fishers in the Columbia River. All hatchery-produced Chiwawa fish are CWT-marked and receive an adipose clip or other external identification to allow for broodstock selection of returning adults and evaluation of escapement and natural production. Supplementation of the populations should facilitate the recovery of population and associated future harvest. Both wild and hatchery components of spring chinook returning to the Wenatchee River system and its major tributaries including Chiwawa River and Nason Creek are identified for the recovery of the endangered stock.

6.3 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

In an effort to partially address the straying of Chiwawa River spring chinook to other tributaries in the Wenatchee Basin, hatchery origin adults will be collected, to the extent possible, at the Tumwater Dam facility, consistent with maintaining, at minimum, 33% wild origin in the broodstock, when combined with collection at the Chiwawa River weir. CWTs will be extracted and read prior to mating to prevent inclusion of Leavenworth or "out- of- basin" stock gametes into the listed stock. No Carson origin, or other "out- of –basin" spring chinook stock will be incorporated into the Chiwawa River adult supplementation program. Collection of the hatchery origin broodstock component at Tumwater Dam should reduce the potential number of Chiwawa River origin fish that may stray to other locations in the basin.

Additionally Ecological effects on wild fish:

The risk of ecological hazards to listed wild spring chinook resulting from broodstock collection activities, liberations of hatchery-origin spring chinook, and from the return of hatchery fish to natural spawning areas, will be minimized through the following measures:

- All spring chinook encountered in hatchery broodstock collection operations will be held for a minimal duration in traps; generally less than 24 hours.
- Spring chinook trapped in excess of broodstock collection goals will be released upstream immediately without harm. Delay in migration and stress to spring chinook destined for natural spawning will be minimized.
- Rearing and release strategies at all WDFW spring chinook hatcheries are designed to limit adverse ecological interactions through minimizing the duration of interaction between newly liberated hatchery chinook and naturally produced fish.
- Hatchery spring chinook will be reared to sufficient size such that smoltification occurs within nearly the entire population, reducing residence time in the streams after release (Bugert et al. 1991) and promoting rapid seaward migration. Physiological measures of the degree of smoltification within the hatchery population, including allowable fork length coefficient of variation maximums (CV less than 10 %) and average condition factor at release targets (0.9 - 1.0), will be used to indicate when fish should be allowed to volitionally migrate.
- Spring chinook smolt releases will continue to be timed with water budget releases from upstream dams, to further accelerate seaward migration of released hatchery fish, further reducing the duration of any interactions with wild fish; On-station rearing on parent river water will also contribute to the smoltification process leading to reduced hatchery fish residence time in the rivers and mainstem migration corridors;
- Application of criteria defining maximum allowable proportions of precocial males will indicate when fish should no longer be allowed to leave the rearing ponds to limit residualization (Martin et al. 1993);
- All spring chinook will be handled, transported, and propagated in accordance with WDFW Fish Health Manual (WDFW 1996) and Pacific Northwest Fish Health Protection Committee (PNFHPC 1989) disease prevention and control standards to minimize the risk of disease transfer to wild fish;
- Hatchery spring chinook smolts will be liberated after acclimation in the desired adult return location to minimize the risk of straying to other streams, thereby reducing the risk of adverse competitive effects with indigenous wild fish for spawning sites or mates; and

- All hatchery spring chinook will be certified by Fish Health professionals prior to release to minimize the risk of disease transference from hatchery fish to wild fish where they interact in the natural environment.

Genetic effects to listed wild and propagated spring chinook. Loss of genetic variability among populations:

- The risk of loss of among population genetic diversity through out-breeding depression will be minimized through application of several spawning, fish rearing, and fish planting measures within selected watersheds in the ESU. It is acknowledged that among population diversity for a portion of the ESU (Methow River Basin populations) will likely be negatively affected by the proposed WDFW program. Specifically, this effect may result from the consolidation of Methow Basin populations into a single Methow population through collection and mating of up-river-origin spawners arriving at Wells Dam. However, this strategy increases the likelihood for increasing the abundance of fish, and the populations? recovery, over a shorter time.

Impact reduction measures include:

- The most discrete population units possible were targeted for supplementation, after balancing logistical limitations of terminal area collection and release of populations, maintenance of genetic integrity and local adaptation, and management of discrete populations. Discrete populations chosen for individual supplementation and captive brood programs (Chiwawa River, White River, Nason Creek, and Twisp River) represent major nominal spring chinook populations in the Wenatchee and Methow river systems.
- Loss of among population diversity will be limited within the region through designation of non-intervention areas where supplementation and captive brood programs will not be applied. These non-intervention areas will include the Little Wenatchee River and possibly the Entiat River, depending on the results of genetic sampling efforts;
- To provide for a proportion of each population that will not be subjected to artificial propagation and the associated potential risk of negative genetic effects, upstream escapement of approximately 80 adults per population will maintained as a minimum level for natural spawning;
- Planting of hatchery spring chinook smolts after acclimation in the desired adult return location will help minimize straying to other streams, minimizing the risk of interbreeding between unrelated chinook populations, and among population diversity loss; and Assessment and management of straying, and the potential for among genetic diversity effects, will be accomplished through marking of all hatchery spring chinook with a CWT and visual mark. Mass marking will allow for ready differentiation between hatchery and wild fish on spawning grounds.

Loss of genetic variability within populations:

- The risk of loss of within population genetic diversity hazards, including inbreeding depression, genetic drift, or domestication selection will be minimized through the following measures proposed for the captive brood and supplementation programs:
- Diversity-based juvenile collection, spawning, and rearing protocols will be applied for all captive brood programs to help maintain within population diversity, including collection of broodstock by discrete family;
- Founding broodstocks will be established through collection of a representative sample of the total population to lessen the risk of genetic bottleneck. A total of 25-30 chinook salmon families will be sampled throughout target streams each year for eight consecutive years (1997-2004). If escapement to the stream produces less than 25 redds, all redds will be sampled;

- To address genetic concerns regarding selectivity, collection of adult broodstock at traps for supplementation programs shall be random, and representative of the run-at-large with respect to natural and hatchery parentage, migration timing, age class, morphology, and sex ratio;
  To provide for a proportion of each population that will not be subjected to artificial propagation and the associated potential risk of negative genetic effects, upstream escapement of approximately 80 adults per population will be maintained as a minimum level for natural spawning;
- While an effective population size (Ne) of at least 50 adults per generation is required to reduce the risk of inbreeding depression and genetic drift in the short term (fewer than 5 salmon generations) (BAMP 1998), an Ne of 500 fish per population per generation should be the long term program production objective to maintain an adequate genetic base. If fewer adults are available, production can be scaled to ensure that hatchery-origin progeny do not overwhelm the population as a whole; and all fish rearing will occur at minimum pond loading densities to reduce the risk of domestication effects.

Section 7. Broodstock Collection

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

Adults trapped at the Chiwawa River weir and Tumwater Dam on the Wenatchee.

7.2 Collection or sampling design

The Wenatchee Basin program collection is consistent with the Upper Columbia River Salmon and Steelhead Broodstock Objectives as determined yearly by the technical committees. Spring chinook target is not to exceed 400 mixed origin, fish from Chiwawa and Tumwater Dam. If less than 20 salmon have been collected by 15 August (aggregate of Tumwater and Chiwawa River sites), trapping will be terminated and all spring chinook held in captivity will be returned to the point of collection for natural spawning. All bull trout trapped will be transported by tank truck and released into a quiet water area at least 1.0 km upstream of the weir.

Consistent with the yearly broodstock and site-based collection protocol, wild and hatchery origin spring chinook will be retained to provide, at a minimum, a 1:2 ratio of wild to hatchery origin fish within the hatchery broodstock (when combined with Tumwater Dam collections). All spring chinook captured at the Chiwawa weir and retained for broodstock purposes will be transported to the Eastbank Fish Hatchery for holding and spawning. All spring chinook trapped and not needed for broodstock are transported via tank truck to a location approximately 10 miles upstream of the trap site and released.

Draft adult broodstock collection protocols such as those outlined below (2003-04) are keyed on target numbers at various collection sites operated by WDFW that provide broodstock for Mid-Columbia PUD mitigation program facilities. Adult broodstock collection protocols are to be considered an interim and dynamic hatchery broodstock collection plan, which may be altered following joint fishery party (JFP) discussions. As such, there may be significant in-season changes in broodstock numbers, locations, or collection times, brought about through continuing co-manager consultation and in-season monitoring of the anadromous fish runs to the Columbia River above Priest Rapids Dam.

Chiwawa spring chinook hatchery program and assumptions:

2002 Program assumptions:

R.I. Settlement Program	672,000 yearling smolts
Broodstock required	379 Adults
Propagation survival	83% fertilization to release
Fecundity	4,400 eggs per female
Female to male ratio	1 to 1
Pre-spawn survival	97%
Wild/hatchery broodstock composition	33% / 67%
Wild ESA adults to Wenatchee Basin	426
Estimated wild proportion to Chiwawa	61%
Estimated wild to Chiwawa	260
Hatchery ESA to Wenatchee Basin	90
Estimated Proportion to Chiwawa	40%
Estimated Hatchery to Chiwawa	36
Chiwawa weir extraction rate	25%-31%
Projected wild broodstock collection	65 - 81
Projected hatchery origin collection (Chiwawa and Tumwater Dam)	30 - 30
Total	95 - 111-

Chiwawa River Weir

The Chiwawa Weir is considered the preferred broodstock collection site for the adult-based supplementation program. As is typical of stream-type chinook salmon in the region, adults enter the Chiwawa River from May through the onset of spawning (primarily in September). To comport with this migration period, and to meet natural production objectives, the Chiwawa River weir and trap will be operated between June 1 and September 10. During this period, the trap will be actively operated 24 hours per day, four days per week, with weir panels removed for three days per week. This schedule is maintained to help ensure unimpeded upstream and downstream passage for natural spawning escapement purposes three days per week. The trapping schedule can change year to year, dependent upon spring chinook salmon run strength, inter annual adjustments for trap efficiency, and the commensurate adjustment of broodstock collection protocols. The Chiwawa River trap/weir, the primary broodstock collection site, retains no more than 30% of the naturally produced adults returning to the river, and maintains a minimum of 33% of the broodstock as naturally-produced adults. The Tumwater Dam trap is a secondary broodstock collection site, and is operated when runs are diminishes to augment numbers of fish collected at the Chiwawa location. The program can retain up to 400 spring chinook (combined Chiwawa River/Tumwater Dam collections). Broodstock and program numbers are determined by the meeting an adult collection minimum of 33% wild origin fish. Collection of hatchery origin fish will be dependent upon hatchery origin collection numbers at Tumwater Dam. If the sex ratio is skewed toward females, in-season adjustments will be made to reduce the total broodstock collection, consistent with the 672,000- smolt production objective.

The Chiwawa weir will trap 24-hours/day, 4 days up and 3 days down, between June and September, maintaining a consistent schedule to ensure unimpeded escapement upstream. If Tumwater Dam videotape review indicates spring chinook passage at Tumwater Dam prior to 1 June, trapping at Chiwawa will commence within 48 hours. Spring chinook retained will be transferred to Eastbank FH for holding in cool well water. In the event that hatchery origin fish are required to be released, to maintain the 1/3 wild proportion, they will be transported by tank truck to a release point located upstream from the weir and released. The weir spans the river at RK 2.0, and directs fish into a "V"-type entry installed in a holding box to trap and maintain upstream-migrating salmon. The weir and trap are continuously monitored by Chiwawa Salmon Hatchery personnel when operating to keep the weir clear of debris and to ensure proper and safe functioning of the trap. An additional responsibility is monitoring of the incidence, and live removal of, ESA-listed bull trout kelts that may potentially become impinged on the weir face.

Captured fish are removed daily when the trap is operating, either by hand or by using a soft mesh cotton dip-net. A portion of spring chinook collected are retained as broodstock, and all other species are passed upstream after enumeration and the collection of any biological information that is desired. Spring chinook retained as broodstock are transported via tank truck to Eastbank Hatchery where they are held and spawned.

Tumwater Dam Trap

Although secondary in priority as a collection site for the program, the WDFW trap at Tumwater Dam is operated when runs are diminished to augment the sparse numbers of fish collected at the Chiwawa Trap. Only marked Chiwawa Hatchery-origin spring chinook are collected at Tumwater Dam for inclusion as broodstock in the Chiwawa River supplementation program.

The Tumwater Dam trap will be operated from June 9 through July 31 each year to collect spring chinook broodstock. The trap will be actively operated 16 hours per day on a set schedule of three days per week during this period. The trap is situated at the top of the ladder providing fish passage around the dam, on the left bank of the river. Fish are trapped through closure of a gate at the top of the trap, which prevents upstream passage, maintaining the fish in a 10' x 50' x 8' deep holding pond.

The pond lacks a "V" entry, and fish are therefore not prevented from returning to downstream areas. The trap is actively run, with fish allowed to exit the pond upstream via a *Denil* ladder shunted into a 4' x 4' holding box for immediate loading into a tanker truck. The fish may also be passed into the dam forebay in this manner. Collected fish will be identified by species and as of wild or hatchery-origin. Marked spring chinook collected at Tumwater will be trucked to Eastbank Hatchery, where the fish will be combined with Chiwawa collections for holding and spawning. Per the 2003 broodstock and site-based collection protocols, chinook retained at Tumwater Dam have been restricted to hatchery origin fish and were marked using Visual Implant Elastomer (VIE) tags. Trapping can begin in May and operated as needed to collect the initial 20-hatchery origin spring chinook. Once the 20 fish goal is met, the trap is operated sporadically as determined by wild collections at the Chiwawa River weir, consistent with maintaining a minimum a 1:2 ratio of wild to hatchery origin fish within the hatchery broodstock.

7.3 Identity.

Chiwawa/Nason spring chinook stock as managed as composite in the Wenatchee Basin (Permit # - 1196 2003 Annual Report). Since 1993, an estimated 25% of all Chiwawa spring chinook recovered on the spawning grounds were found in Nason Creek. With this degree of straying, the current program appears to be augmenting the Nason Creek population, with an unknown impact to either population. To partially address the straying of Chiwawa River hatchery origin fish, trapping at Tumwater Dam will be the focus of the hatchery origin portion of the broodstock collection. Infusion of wild origin stock into the Chiwawa River supplementation program (Chiwawa River) is also an important element to the success of recovery of the Wenatchee River spring chinook ESU and will be an additional focus element in the broodstock collection for 2003. Adult spring chinook broodstock are trapped and collected on the lower Chiwawa River (RKm 2.0) and at the Tumwater Dam on the Wenatchee River (RKm 52.0). The Chiwawa River trap/weir, the primary broodstock collection site, retains no more than 30% of the naturally produced adults returning to the river, and maintains a minimum of 33% of the broodstock as naturally-produced adults. The Tumwater Dam trap is a secondary broodstock collection site, and is operated when runs are diminishes to augment numbers of fish collected at the Chiwawa location. Only marked Chiwawa hatchery-origin chinook are collected at Tumwater Dam for inclusion as broodstock in the program.

7.4 Proposed number to be collected:

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

Of the combined total number of naturally produced spring chinook salmon adults and jacks that return to the Chiwawa River and Nason Creek each year, WDFW may retain no more than 400 or one-third, which ever is less, for broodstock to meet the smolt production levels of the program.

7.4.2 Broodstock collection levels for the last twelve years (e.g. 1990-2001), or for most recent years available.

Year	Adults		
	Females	Males	Jacks
Planned	190	190	
1990	12	7	
1991	18	10	
1992	39	36	
1993	49	52	

1994	6	7	
1995*	NA	NA	
1996	4	5	5
1997	71	39	1
1998	20	26	1
1999*	NA	NA	
2000^	11	14	5
2001^	241	129	1
2002^	34**		
2003^	46	39	
2004^	215**		
2005			

*The returning adult run for the years 1995 and 1999 was insufficient for program broodstock collection.
** Years not broken down by sex.
^ Preliminary numbers until verified in Section 10 Annual reports.

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

See Section 7.4, depending on annual returns the level of fish collected has been determined by the WDFW and the HCP Hatchery Committees. Adult and jack endangered UCR spring chinook salmon not retained for broodstock are released unharmed above the respective trapping facility for natural spawning immediately after being enumerated.

7.6 Fish transportation and holding methods.

Equipment Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Flatbed Truck with Tank (adult hauling)	250	Y	N	45	MS 220 and NaCl	10 ppm (MS 220) and 0.5-1.0% (NaCl)
Tanker Truck	2500	Y	N	60	MS 220 and NaCl	5-1.0% (NaCl)

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
2	Concrete Ponds (Partitioned with Screen)	7500	100	15	5	900

1	V-Type Trap/Weir with Holding Box (Chiwawa River)					
1	Tumwater Adult Holding Pond (Tumwater Trap/Weir Facility)	4000	10	50	8	U

At Eastbank Hatchery, adult spring chinook are being held upstream of adult summer chinook in holding raceways that are partitioned by screens.

7.7 Describe fish health maintenance and sanitation procedures applied.

For all production programs under the Mid and Upper Columbia Hatchery Programs, standard fish health monitoring will be conducted (monthly checks of salmon and steelhead) by fish health specialist, with intensified efforts to monitor presence of specific pathogens that are known to occur in the donor populations (specific reactive and proactive strategies for disease control and prevention are outlined in Appendix I). Significant fish mortality to unknown cause(s) will be sampled for histopathological study. Fish health maintenance strategies are described in IHOT (1995). Incidence of viral pathogens in salmon and steelhead broodstock will be determined by sampling fish at spawning in accordance with the Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State. Populations of particular concern may be sampled at the 100% level and may require segregation of eggs/progeny in early incubation or rearing. Incidence of *Renibacterium salmoninarum* (Rs, causative agent of bacterial kidney disease) in salmon broodstock will also be determined by sampling fish at spawning. Where appropriate, collected broodstock will be sampled for enzyme-linked immunosorbent assay (ELISA). If required, hatchery staff will segregate eggs/progeny based on levels of Rs antigen, protecting "low/negative" progeny from the potential horizontal transmission of Rs bacteria from "high" progeny. Progeny of any segregation study will also be tested by ELISA; at a minimum each segregation group would be sampled at release. Necropsybased condition assessments (based on organosomatic indices) will be used to assess condition of hatcheryreared salmon and steelhead smolts at release, and wild salmon and steelhead during outmigration. If needed, condition assessments will be done at other key times during hatchery rearing.

7.8 Disposition of carcasses.

Integrated Hatchery Operations Team (IHOT), Pacific Northwest Fish Health Protection committee (PNFHPC), state or tribal guidelines are followed for broodstock fish health inspection , transfer of eggs or adults and broodstock holding and disposal of carcasses. Carcasses of the ESA-listed fish spawned in captivity may be outplanted in the Wenatchee River watershed for nutrient enrichment if disease protocols as determined by the co-managers fish health specialists are met, donated for educational purposes, incinerated, buried on-station after completion of spawning or disposed of at waste disposal facilities.

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

In an effort to minimize adverse impacts to ESA-listed spring chinook and ESA-listed Upper Columbia River steelhead, Washington Department of Fish and Wildlife (WDFW) trapping locations, dates and frequency were consistent with the Year 2003 Upper Columbia River Salmon and Steelhead Broodstock Objectives and Site-Based Broodstock Collection Protocols. Holding facilities at Eastbank FH include covered raceways and surface water spray to minimize disturbance,

provide shade and reduced jumping by adults. Traps were checked at least once daily and no out-of-water transfers occurred during transfer from trap site to holding sites. Wenatchee and Chiwawa weir trapping included on-site security to minimize potential impact to steelhead kelts and spring chinook. While trapping and handling procedures for adult chinook were implemented to minimize potential adverse affects to listed stocks, inevitably, some mortality occurred and was specific to trapping and holding of adult chinook.

If water temperatures at adult trapping sites exceeds 69.8°F (21°C), the trap operation shall cease pending further consultation with NMFS to determine if continued trap operations poses substantial risk to ESA-listed species.

- When using methods that capture a mix of species, ESA listed fish must be processed first. The transfer of ESA listed fish must be conducted using equipment that holds water during transfer (e.g., sanctuary net or boot).
- Carson origin chinook and out-of basin stray fish are kept out of the broodstock collection and accomplished through scale sample and coded-wire tag (CWT) analysis.
- Broodstock is randomly collected over the run entry pattern per prescribed protocols established by program managers and geneticists.
- Broodstock is randomly collected over the run entry pattern per prescribed protocols established by program managers and geneticists to protect important traits and attributes relative to long-term fitness.
- Broodstock is randomly collected over the run entry pattern per prescribed protocols established by program managers and geneticists to protect important traits and attributes that improve the survival of the entire population (hatchery and natural components).
- All bull trout trapped will be transported by tank truck and released into a quiet water area at least 1.0 km upstream of the weir.

Section 8. Mating

8.1 Selection method.

All males and females which have been collected for broodstock will be examined weekly during the spawning season to determine ripeness, and all fish will be spawned when ripe. Spawning activities for ESA-listed spring chinook retained from the Wenatchee basin will normally occur from mid-August to mid-September. In-situ stock separation of ESA-listed spring chinook, Carson origin and out-of basin stray fish was accomplished through scale sample and coded-wire tag (CWT) analysis. Ninety-nine percent of the spring chinook included in the spawning activity were Chiwawa River hatchery origin fish collected from the Chiwawa River or at Tumwater Dam and wild origin fish collected from the Chiwawa River weir. Forty-four (44) females were spawned, 43 of which were incorporated into the Wenatchee River supplementation program (Table 3). One female was identified as a stray (Hood River, Oregon), and was therefore excluded from the program. Fecundity of Chiwawa River spring Chinook averaged 4,400 eggs/female, slightly greater than the expected 4,000 eggs/female. Spawning activities provided an estimated 196,159 green eggs, resulting in 161,104 eyed-eggs (Table 7). Three different parental cross groups resulted during the spawning process and were dominated by HxW parental crosses, followed by HxH and WxW (86.7%, 11.3% and 1.8% of the eye- egg total, respectively) (Table 11).

Table 11. Egg collection summary of brood year 2002 upper Columbia River Chiwawa spring chinook, August-September 2002.

Parental Cross	Green Eggs	Fertilization Rate	Eyed Eggs	% Egg Total
HXH	18,783	97.07%	18,232	11.32%
HxW	171,329	81.56%	139,744	86.74%
WxW	6,047	51.73%	3,128	1.94%
Total	**196,159**	**82.13%**	**161,104**	**100.0%**

8.2 Males.

Males may be live-spawned on the first spawning day as necessary to make up for a low naturally-occurring male to female ratio. However, inclusion of jack chinook in the run-at-large broodstock collections helps to alleviate occasional low adult male occurrence.

Collect jacks in similar proportion to the run-at-large. Inclusion of jack chinook in the run-at-large broodstock collections helps to alleviate occasional low adult male occurrence. The hatchery broodstock remains genetically similar to, and representative of, the spring chinook populations.

8.3 Fertilization.

Spawning protocols reflect the need to maintain genetic diversity of the separate summer chinook populations. Spring chinook collected from the Wenatchee River are maintained at Eastbank Hatchery as separate populations and spawned at a 1 male to 1 female ratio. Gametes of the least numerous sex are split into subsets and these are crossed with gametes from a different individual of the more numerous sex.

Fertilization methods The following strategy can be used to fertilize spring chinook salmon:
(1) breed as many parents as is feasible;
(2) mate at least one male per female in daily matings; whenever possible, split the gametes of the least numerous sex into subsets and cross each subset with gametes from a different individual of the more numerous sex;
(3) live spawn males, and mark them after their use.

8.4 Cryopreserved gametes.

Cryopreserved 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 listed natural fish resulting from the mating scheme.

- A portion of each days egg-take is used for on site production to help ensure that the hatchery broodstock remains genetically similar to, and representative of, the up-river summer chinook populations. A 1:1 mating scheme is employed.
- Males may be live-spawned on the first spawning day as necessary to make up for a low naturally-occurring male to female ratio. However, inclusion of jack chinook in the run-at-large broodstock collections helps to alleviate occasional low adult male occurrence.
- Collect jacks in similar proportion to the run-at-large. Inclusion of jack chinook in the run-at-large broodstock collections helps to alleviate occasional low adult male occurrence. The hatchery broodstock remains genetically similar to, and representative of, the up-river summer chinook populations.
- Fish health procedures used for disease prevention include biological sampling of spawners. Generally, sixty ovarian fluid and kidney/spleen samples are collected from female spawners to test for the presence of viral pathogens. The enzyme-linked immunosorbent assay (ELISA) is conducted on kidney samples from 100 females. This assay detects the antigen for *Renibacterium salmonarium*, the causative agent of bacterial kidney disease (BKD).

Section 9. Incubation and Rearing.

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

Egg take goal is 809,000 eggs (2005-06 FBD).

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 (%)
1990	60,287	91.8	90.1	92.0	97.9	72.0	99.2
1991	73,601	94.4	96.1	92.0	93.1	72.0	95.0
1992	111,624	98.4	96.7	92.0	80.1	72.0	80.6
1993	257,209	89.7	98.0	92.0	98.8	72.0	99.7
1994	35,539	98.6	100.0	92.0	76.9	72.0	78.9
1995	No program this year						
1996	18,579	88.3	100.0	92.0	94.4	72.0	97.7
1997	313,182	93.2	95.7	92.0	96.3	72.0	99.3
1998	90,521	94.5	99.0	92.0	89.6	72.0	99.1
1999	No program this year						
2000	55,256	91.0	98.1	92.0	96.3	72.0	99.3
2001	1,059,500 *	See HGMP section 9.2.1.					
2002	196,159						
2003	326,500						
2004	558,000						
2005							

* Carson eggs included.

9.1.2 Cause for, and disposition of surplus egg takes.

Permit conditions allow a maximum number of broodstock to collect. If fecundity is larger or much higher levels of survival occurs, then WDFW shall, at the first indication that annual production will exceed the 672,000 smolt goal for the Chiwawa River, obtain written approval from the Hatcheries and Inland Fisheries Branch, NOAA Fisheries, to continue to rear and release fish in excess of the 672,000 production goal.

9.1.3 Loading densities applied during incubation.

Integrated Hatchery Operations Team (IHOT) species-specific incubation recommendations were followed for water quality , flows , temperature , substrate and incubator capacities. Heath stack incubators are used to incubate the summer chinook eggs at Eastbank Hatchery and Wells Hatchery. Incubation conditions at the two hatcheries are designed on loading densities recommended by Piper et al. (1982).

9.1.4 Incubation conditions.

Eggs are incubated full-term(Green egg-Emergence) at Eastbank Hatcheries. Hatchery. Individual female/matings are incubated in individual iso-buckets to eyed-egg stage to segregate for ELISA (BKD) values. Eggs of subyearling production component are incubated on ambient temperature well water that results in fry emergence around mid-January. Whereas eggs of yearling production component are incubated on chilled temperature well water that results in fry emergence around latter part of April.

Influent and effluent gas concentrations at the hatcheries and within the acclimation ponds, including dissolved oxygen concentrations, are within parameters optimal for juvenile salmonid production and survival. Eastbank Hatchery has 70 half-stacks of vertical incubators equipped with a chilled water supply, eight 3,750 cu ft raceways and five 22,200 cu ft raceways (Chapman et al. 1994). This water varies in temperature from a low of 46° F in May to a high of 57° F in December.

9.1.5 Ponding.

Fry are transferred from Heath trays for ponding upon button-up and swim-up. Ponding generally occurs after the accumulation of 1,650 to 1,750 temperature units. Unfed fry are transferred to the rearing ponds from early May through early June. The normal weight for fry initially ponded at Eastbank Hatchery for brood years 1989-95 was 0.45 grams (1000 fish per pound). The fry fork length recorded for the same brood years was 36 to 40 mm.

9.1.6 Fish health maintenance and monitoring.

Eggs will be examined daily by hatchery personnel. Prophylactic treatment of eggs for the control of fungus is prescribed by fish health specialists, and may include treatment with formalin or other accepted fungicides. Non-viable eggs and sac-fry will be removed by bulb-syringe. Adherence to WDFW, Pacific Northwest Fish Health Protection Committee, and IHOT (1995) fish disease control policies reduces the incidence of diseases in fish produced and released from Eastbank facilities. No fish disease outbreaks have been experienced during the incubation to ponding period in the summer chinook programs in recent years and mortality levels have remained within program standards. Fish health is continuously monitored in compliance with Co-manager Fish Health Policy standards (WDFW and WWTIT 1998). Rearing space at Eastbank was designed to maintain maximum loading densities below the criteria of Piper et al. (1982), as modified by Wood (Chelan PUD and CH2MHILL 1988).

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.

All eggs brought to the facility will be surface-disinfected with iodophor (as per disease policy). All equipment (nets tank and rain gear) is disinfected with iodophor between different fish/egg lots. Different fish/egg lots will be physically isolated from each other by separate ponds or incubation units. Incubation units will be further isolated by plastic curtains. The intent of the activities is to prevent the horizontal spread of pathogens by splashing water. Tank trucks will be disinfected between the hauling of different fish lots. Foot baths containing iodophor will be strategically located on the hatchery grounds (i.e., entrance to “clean” or isolated areas of the incubation room) to prevent spread of pathogens. Formalin drips are applied to prevent fungal spread from a small group of dead eggs. Flow, D.O. and temperature units (TU) are monitored per IHOT or program guidelines.

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 (1990-2001), or for years dependable data are available.

Developmental Stage	Standard Set	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	AVG	PE*
Fertilize to eye	**92.0**	98.0	91.8	94.4	98.4	89.7	98.6	Na	88.3	93.2	94.5	Na	91.0	88.9	Na	97.0	1.5
Eye to ponding	**98.0**	99.1	90.1	96.1	96.7	98.0	100.0	Na	100.0	95.7	99.0	Na	98.1	98.1	Na	98.9	-0.7
30 days post ponding	**97.0**	99.1	99.5	99.6	99.9	99.7	99.8	Na	93.8	98.3	98.5	Na	97.2	99.7	Na	93.3	1.7
100 days post ponding	**93.0**	99.0	98.9	97.9	99.9	99.3	99.4	Na	93.0	99.6	98.3	Na	96.6	99.6	Na	97.4	5.7
Ponding to trans-port	**72.0**	97.0	97.9	93.1	80.1	98.8	76.9	Na	94.4	96.3	89.6	Na	96.3	99.0	Na	98.6	28.7
Trans-port to release	**95.0**	99.3	99.2	95.0	80.6	99.7	78.9	Na	97.7	99.3	99.1	Na	99.3	51.8	Na	98.3	-4.3
Fertili-zation to release	**65.0**	93.6	88.2	84.5	76.2	86.9	75.9	Na	79.4	85.3	83.6	Na	85.3	44.7	Na	92.7	23.6

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

The rearing conditions at Wells and Eastbank hatcheries (as well as its acclimation ponds) are designed on loading densities recommended by Piper et al. (1982; 6 lb/gpm and 0.75 lb/ft3) and Banks (1994; 0.125 lb/ft3/in) (BAMP 1998). Fry are transferred from the Heath incubation trays to fiberglass rearing tanks for start feeding, and then to raceways for continued rearing. The tanks have flow through water circulation. Fingerlings are transferred to the acclimation ponds in the tributaries in October (Chiwawa Ponds).

9.2.3 Fish rearing conditions.

Fish are reared on a combination of Chiwawa River and Wenatchee River pumped water. Temperature, dissolved oxygen and pond turn over 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. Settle-able solids, unused feed and feces are removed regularly to ensure proper cleanliness of rearing containers. All ponds are broom cleaned as needed and vacuumed monthly for the yearling pond. Ponds are pressure washed between broods. Temperature and dissolved oxygen are monitored and recorded daily during fish rearing. Ponds are covered with bird netting.

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.

Rearing Period	Length (mm)	Weight (fpp)	Condition Factor	Growth Rate
4/1/97	39.7	768.8	0.93	-
5/31/97	59.7	199.8	0.97	0.740
7/2/97	73.6	92.6	1.23	0.537
8/1/97	85.0	52.6	1.40	0.432

8/30/97	100.7	31.0	1.43	0.411
9/26/97	111.1	23.3	1.42	0.248
10/28/97	118.5	17.8	1.53	0.236
11/25/97	125.9	16.0	1.40	0.101
12/30/97	131.9	14.3	1.39	0.106
1/28/98	134.7	13.3	1.39	0.0699
2/24/98	139.2	12.4	1.35	0.0677
3/30/98	143.5	10.8	1.42	0.129
4/29/98	157.2	8.7	1.34	0.194

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

See Section 9.2.4 above.

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
Ponding to 400 fpp	BioDiet Starter 3	24	2.5-4.0	0.0003	0.7
400-300 fpp	BioMoist Grower 1.0 mm	12	2.5	0.0010	0.7
300-180 fpp	BioMoist Grower 1.3 mm	4	2.0	0.0045	0.75
180-100 fpp	BioMoist Grower 1.5 mm	1	2.0	0.0235	0.8
100-45 fpp	BioMoist Grower 2.0 mm	1	2.0	0.0182	0.85
45-25 fpp	BioMoist Feed 2.5 mm	1	1.5	0.0306	0.9
25-10 fpp	BioMoist Feed 3.0mm	Feeding Rate Variable (Chiwawa Cold Water Source); Lbs. Fed/gpm of Inflow Variable;			1.0

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

For all production programs under the Mid and Upper Columbia Hatchery Program, standard fish health monitoring will be conducted (monthly checks of salmon and steelhead) by fish health specialist, with intensified efforts to monitor presence of specific pathogens that are known to occur in the donor populations. Significant fish mortality to unknown cause(s) will be sampled for histopathological study. Fish health maintenance strategies are described in IHOT (1995). Incidence of viral pathogens in salmon and steelhead broodstock will be determined by sampling fish at spawning in accordance with the Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State. Populations of particular concern may be sampled at the 100% level and may require segregation of eggs/progeny in early incubation or rearing. Incidence of *Renibacterium salmoninarum* (Rs, causative agent of bacterial kidney disease) in salmon broodstock will also be determined by sampling fish at spawning. Where appropriate, collected broodstock will be sampled for enzyme-linked immunosorbent assay (ELISA). If required, hatchery staff will segregate eggs/progeny based on levels of Rs antigen, protecting low/negative" progeny from the potential horizontal transmission of Rs bacteria from "high" progeny. Progeny of any segregation study will also be tested by ELISA; at a minimum each segregation group would be sampled at release. Necropsy based condition assessments (based on organosomatic indices) will be used to assess condition of hatchery reared salmon and steelhead smolts at release, and wild salmon and steelhead during out migration. If needed, condition assessments will be done at other key times during hatchery rearing.

Fish health and disease condition are continuously monitored in compliance with Co-manager Fish Health Policy standards (WDFW and WWTIT 1998). Fish are monitored daily by staff during rearing for signs of disease, through observations of feeding behavior and monitoring of daily mortality trends. A fish health specialist will monitor fish health as least monthly. More frequent care will be provided as needed if disease is noted. Hatchery Specialists under the direction of the Fish Health Specialist will provide treatment for disease. Sanitation will consist of raceway cleaning as necessary by brushing, and disinfecting equipment. Fish health and condition is monitored on-site by fish health professionals at the chinook rearing locations ten to fifteen times during the freshwater rearing period. In particular, chinook are screened prior to transfer and again at release for the incidence of bacterial kidney disease (BKD) through the ELISA process.. The results of fish health monitoring for the summer chinook programs are presented each year in WDFW Rock Island Fish Hatchery Complex annual reports.

Programs can experience elevated losses associated with bacterial kidney disease (BKD) which were treated at least twice for BKD with erythromycin. Other problems can be Enteric Redmouth which is treated with a five-day treatment of Romet feed.

All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots. Tank trucks are disinfected between the hauling of adult and juvenile fish. Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

The general policy of the WDFW, the USFWS, and the Tribe Co-managers is to bury juvenile fish mortalities, and dead eggs to minimize the risk of disease transmission to natural fish. The action agencies may place at least some of the adult salmon carcasses in regional streams for nutrient enrichment purposes, consistent with permitting and disease certification protocols. If adult carcasses are not used for nutrient enhancement they will be buried or disposed of at a local waste disposal site. The distributing of spawned, dead carcasses into the natural environment should benefit natural fish productivity through nutrient enrichment. NMFS finds that risk to the listed populations is minimal if disease certification protocols are followed.

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

Degree of smoltification is monitored through monthly collection of data indicating average condition factor (Kfl) of the populations. Gill ATPase levels have been monitored in the past to attempt to indicate degree of smoltification. However, this index has not been found to be a useful tool for determining when to begin releases, due to the delay in obtaining results from sampling, and the finding that ATPase levels do not actually increase until the smolts are actively migrating in the Columbia River (Petersen et al. 1999b). OSI analysis of Methow Composite fish are measured and in 2004 provided a normality index of 97.5%.

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

Natural rearing methods are approached through the transfer of most chinook smolts to acclimation ponds at release locations. The trapezoidal, hypalon-lined ponds provide a lower density rearing location for the fish on their home water. The ponds therefore provide a more natural setting for the populations than if the fish were retained in concrete raceways, and released at central locations or scatter-planted to the upper river tributaries.

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.

- Marked fish from outside of the Mid-Columbia Region will be excluded from the Methow broodstock. Progeny from adults captured at Wells Dam that are from the Entiat and Wenatchee programs will be returned to their hatchery of origin, if this action in consistent with fish health protocols. This will require reading of CWTs during spawning at both hatcheries.
- Adults may be PIT tagged (or individually marked by some means) to identify them by time of arrival. If too many adults are collected because the actual run size differs substantially from the prediction, adults may be selected for return to the river for natural spawning. This will be done in a manner that allows an adequate representation of the gene pool, and is consistent with ongoing disease prophylaxis treatments. Late arriving adults will be genotyped through in-situ scale pattern analysis and maturation timing to help ensure that ocean-type chinook salmon are not inadvertently included in the broodstock.
- In-situ stock separation of Methow Composite, Twisp, Carson-based Winthrop stock and stray fish via scales and CWTs during spawning operations will continue.

Section 10. Release

10.1 Proposed fish release levels.

The agreement with Chelan PUD is to provide the necessary capacity to allow artificial propagation compensation of 672,000 yearling UCR spring chinook salmon juveniles for release in the Wenatchee River Basin as described in the HCP agreements (CPUD 2002a, 2002b).

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

Fish are released from the Chiwawa Rearing ponds located at RKm 3.2 on the Chiwawa River.

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

Note: Release numbers are preliminary until verified in WDFW Section 10 Annual Reports.

Yearling Release			
Release Year	No.	Date (MM/DD)	Avg Size (fpp)
1991	43,000	May 2-19	12.0
1992	53,170	April 20-May 5	14.0
1993	62,138	April 21-28	15.0
1994	85,113	April 14-26	16.0
1995	223,610	April 14-26	15.0
1996	27,226	April 15-26	15.0
1997*	NA	NA	NA
1998	15,176	April 29	9.0
1999	266,148	April 19-26	12.0
2000	75,906	April 10	12.0
2001*	NA	NA	NA
2002	47,104	April 22-29	10.0
2003	377,544	April 21 – May 12	11.8
2004	149,668	April 19 –May 14	NA
2005			

* Per broodstock collection guidelines, not enough adult were available for the program.

10.4 Actual dates of release and description of release protocols.

See Section 10.3 for release dates. Releases from the acclimation pond at the beginning of the release period in April are volitional for approximately 20 days with the remaining fish forced out by mid-May.

10.5 Fish transportation procedures, if applicable.

Subyearling fish are transported from the Eastbank Hatchery to the Chiwawa Rearing/Acclimation Ponds in September or October by tanker truck. Fish are released from the ponds and do not require transportation.

Equipment Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Tanker Truck	2500	Y	N	60	MS 220 and NaCl	5-1.0% (NaCl)

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

Subyearling fish are transported from the Eastbank Hatchery to the Chiwawa Rearing/Acclimation Ponds in September. The juveniles are reared and acclimated over the winter on a combination of Chiwawa and Wenatchee river water. Warmer Wenatchee River water is infused during rearing to minimize the risk of water loss due to freezing that is possible if only Chiwawa River water were used. The chinook are switched over to 100 % Chiwawa River water in late winter to foster imprinting to the Chiwawa River. Fish are reared to a size of 30 gms (15 fpp) and allowed to volitionally migrate into the Chiwawa River at RK 2.0 the following April or May as yearling smolts.

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

Fish have been released 100% CWT and adipose fin clipped, the exception was the 2001 (no adipose fin clips) and 2002 (45% adipose fin clipped) brood years.

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

WDFW shall, at the first indication that annual production will exceed the 672,000 smolt goal for the Chiwawa River, obtain written approval from the Hatcheries and Inland Fisheries Branch, NOAA Fisheries, to continue to rear and release fish in excess of the 672,000 production goal. In some years such as 2001 brood, a higher proportion than anticipated females (65%) in the Chiwawa broodstock and a higher than expected fecundity can result in an estimated egg take above goals. Consequently, 160,021 and 66,435-eyed eggs were out-planted into the Chiwawa River and Nason Creek, respectively. The overall success of the eyed-egg plants could not be evaluated due to high river conditions during the spring. In the event that circumstances, such as unanticipated, higher-than-expected fecundity, or high egg-to-fry survival rates leads to the inadvertent possession of spring chinook salmon substantially in excess (>110%) of program production levels specified above, then surplus eggs or fish shall be removed from the hatchery population in manner consistent with achieving program goals.

10.9 Fish health certification procedures applied pre-release.

Fish health and disease condition are continuously monitored in compliance with the requirements of the "Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State" (Co-managers 1998), requirements of the Section 10 ESA permit issued and guidelines of IHOT (1995). Spring chinook have been monitored daily by staff during rearing for signs of disease, through observations of feeding behavior and monitoring of daily mortality trends. A fish health specialist has been monitoring fish health as least monthly with these inspections must adhere to the disease prevention and control guidelines established by the Pacific Northwest Fish Health Protection Committee; More frequent care will be provided as needed if disease is noted. Prior to release, the

population health and condition is established by the Area Fish Health Specialist. This is commonly done 1-3 weeks pre-release and up to 6 weeks on systems with pathogen free water and little or no history of disease.

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

In the event of a water system failure, screens would be pulled to allow fish to exit the ponds or in some cases they can be transferred into other rearing vessels to prevent an emergency release. Chiwawa Satellite Rearing and Acclimation Phase: Outlet screens/stop logs of the ponds would be pulled, and fish would be forced out or allowed to volitionally move into the Chiwawa. This would be dependent on if the survival of the program is in jeopardy only. WDFW also has emergency response procedures for providing back-up pumps, transport trucks, etc. in cases of emergency. In cases of severe flooding the screens are not pulled because flood waters rise to the point where they breach the ponds. Every effort will be made to avoid pre-programmed releases including transfer to alternate facilities. Emergency releases, if necessary and authorized, would be managed by removal of outlet screens and pull sumps of the rearing units. If possible, staff would set up portable pumps to use river water to flush the fish.

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.

Measures have been applied to ensure that artificially propagated UCR spring chinook salmon juveniles that are released as yearlings are ready to actively migrate to the ocean with minimal delay. The rearing and release strategies are designed to limit ecological interactions between hatchery and naturally produced fish. Fish are reared until smoltification has occurred within nearly the entire population, which reduces residence time in streams following release (Bugert et al. 1991). To indicate when fish should be allowed to volitionally migrate, physiological measures of the degree of smoltification within the hatchery population, including allowable fork length coefficient of variation maximums (CV less than 10%) and average condition factor at release targets (0.9 - 1.0) will be used.

Fish have been monitored daily by staff during rearing for signs of disease, through observations of feeding behavior and monitoring of daily mortality trends. A fish health specialist has been monitoring fish health as least monthly. More frequent care will be provided as needed if disease is noted. Prior to release, population health and condition is established by the Area Fish Health Specialist. Adherence to WDFW, Pacific Northwest Fish Health Protection Committee, and IHOT (1995) fish disease control policies will reduce the incidence of diseases in hatchery fish produced and released. Fish health management programs affecting all stocks, and fish health activities specific for each complex, are detailed in Appendix II, under "Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread, or amplification of fish pathogens."

Through these practices, smolts will migrate seaward without delay, minimizing interactions with listed wild spring chinook and steelhead juveniles and smolts that rear in and/or migrate through freshwater and estuarine areas. In addition, smolt releases will continue to be timed with water budget releases from upstream dams, to further accelerate seaward migration of released hatchery fish and reduce the duration of any interactions with wild fish. On-station rearing of spring chinook on parent river water in the upper Columbia region will also contribute to the smoltification process leading to reduced hatchery fish residence time in the rivers and mainstem migration corridors.

Variance from this smolts-only release requirement shall only be allowed in the event of an emergency, such as flooding, water loss to raceways, or vandalism, that necessitates early release of ESA-listed spring chinook or steelhead to prevent catastrophic mortality. Any emergency steelhead

releases made by the action agencies shall be reported immediately to the NMFS Salmon Recovery Division in Portland.

All artificially propagated UCR spring juveniles shall be externally or internally marked (i.e., visual implant elastomer tag or adipose fin clipped) prior to release.

At least a representative portion of the artificially propagated UCR spring chinook juveniles can be internally tagged (e.g., CWT, PIT tag) prior to release to allow monitoring and evaluation of fish performance and contribution rates, including straying levels to natural spawning areas and to other hatcheries. The appropriate level of tagging shall be based in the investigational or management objectives and shall be reviewed by a trained statistician or biometrician.

Section 11. Monitoring and Evaluation of Performance Indicators

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

WDFW submits annual reports as conditioned by Section 10 Permit # - 1196 covering the period from January 1- December 31 each year per permit Reporting and Annual Authorization Requirements; Section C.1-C.9. Specifically, the annual reports include detailed activities as per requirements including monitoring of performance indicators identified for the program. A summary documenting the monitoring and evaluation activities associated with endangered UCR spring chinook hatchery supplementation program is included in annual progress reports submitted to NOAA Fisheries. Such monitoring and evaluation efforts shall include the relative success of juvenile rearing procedures and techniques, a description of any substantial mortality events in the hatcheries, CWT recoveries and analysis, an evaluation of relative success of hatchery x natural and natural x natural crosses and an evaluation of release strategies.

Within Hatchery Environment Monitoring Reporting includes: numbers, pounds, dates, tag/mark information and locations of fish releases; Standard survival benchmarks within the hatchery environment as defined by the HCP Hatchery Committees; Monitoring and evaluation activities that occur within the hatchery environment; Coefficient of variation around the average (target) release size immediately prior to their liberation from the acclimation sites as an indicator of population size uniformity and smoltification status;

Natural Environment Monitoring Reporting includes: Annual adult return information shall include estimates of the number and proportion of artificially propagated fish on the spawning grounds; The number and location of artificially propagated adults that were recovered outside the release areas (e.g., in fisheries or strays to other rivers); Total and index redd counts by tributary basin; Carcass recovery summary which includes sex, origin, tributary location, age, and stock data. Broodstock monitoring and collection summary by location, including summary of all species encountered. Summary of all activities monitoring juvenile UCR spring chinook salmon in the natural environment including trap locations, tributary or sub basin population estimates; Biological sampling conducted on artificially propagated and natural origin juveniles in the natural environment; injuries or mortalities of listed species that result from monitoring activities; and any other information deemed necessary for assessing the program defined by the HCP Hatchery Committees.

The Chelan PUD and Douglas PUD, in coordination with the HCP Hatchery Committees, shall develop five-year monitoring and evaluation plans for the hatchery that are updated every five years. The first monitoring and evaluation plans are due to be completed with in one year of the issuance of the FERC order incorporating the HCP into the hydro project operation licenses. Existing monitoring and evaluation programs shall continue until replaced by the HCP Hatchery Committees newly developed five-year monitoring and evaluation plans. The Chelan PUD and Douglas PUD, shall assume the lead, and work in coordination with the HCP Hatchery Committees, in developing the ten year hatchery program reviews and directing the development of annual summary reports. The program reviews will determine if egg-to-fry and smolt –to-adult survival rates, and other appropriate hatchery program goals and objectives of the HCPs and the ESA section 10 permits have been met or sufficient process is being made towards their achievement. This review shall include a determination of whether artificially propagated production objectives are being achieved.

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

Chelan PUD provides the adequate funding for the M&E/Performance Monitoring activities for this program. WDFW provides the personnel and equipment for conducting these activities. Funding for both five and ten year monitoring and evaluation plans will be decided by the HCP Hatchery Committees and the PUDs. Complementary components to monitor and evaluate adult-based supplementation and captive-rearing of fish will be funded and implemented by the parties to the MCMCP.

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.

WDFW submits annual reports as conditioned by Section 10 Permit # - 1196 covering the period from January 1- December 31 each year per permit Reporting and Annual Authorization Requirements; Section C.1-C.9. Specifically, the annual reports include detailed activities as per requirements including monitoring of performance indicators identified for the program. A summary documenting the monitoring and evaluation activities associated with endangered UCR spring chinook hatchery supplementation program is included in annual progress reports submitted to NOAA Fisheries. Monitoring activities have already been approved by the permit. Any additional harm to listed fish beyond the permit allowances would be communicated immediately to NOAA Fisheries by the WDFW ESA response lead in the area for review or needed changes.

Section 12. Research

12.1 Objective or purpose.

The spring chinook program includes both research and enhancement activities as conditioned by Section 10 Permit # - 1196 Research is directed at determination of supplementation program contribution rates, and ecological and genetic effects of the program on the natural population.

12.2 Cooperating and funding agencies.

Chelan County Public Utility District No. 1 provides the funding for the research/Monitoring-Evaluation Program. Staffing and funding are committed through the Rock Island Settlement Agreement and WDFW Rock Island Evaluations contract to allow most of the data collection, and monitoring and evaluation. Additional funding and staff may be necessary to carry out some of the M&E objectives subsequently identified in the MCMCP or as identified and prioritized through continued evaluation work.

12.3 Principle investigator or project supervisor and staff.

WDFW submits annual reports as conditioned by Section 10 Permit # - 1196 covering the period from January 1- December 31 each year per permit Reporting and Annual Authorization Requirements; Section C.1-C.9. Research activities are also prepared for the Chelan PUD and reported by ESA response staff in WDFW Region 2 office in Wenatchee, Washington.

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

Salmonid Stocks Affected
Lake Wenatchee Sockeye (Little Wenatchee and White rivers)
Wenatchee Summer Chinook
Wenatchee Summer Steelhead
Bull Trout
Resident trout (rainbow, cutthroat, eastern brook)
Whitefish

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

Contact WDFW for research activities prepared for the Chelan PUD.

12.6 Dates or time periods in which research activity occurs.

Early June through late September. and reported by ESA response staff in WDFW Region 2 office in Wenatchee, Washington.

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

Contact WDFW for research activities prepared for the Chelan PUD.

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

Contact WDFW for research activities prepared for the Chelan PUD.

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

Contact WDFW for research activities prepared for the Chelan PUD.

12.10 Alternative methods to achieve project objects.

Contact WDFW for research activities prepared for the Chelan PUD.

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

Salmonid Stocks Affected
Lake Wenatchee Sockeye (Little Wenatchee and White rivers)
Wenatchee Summer Chinook
Resident trout (rainbow, cutthroat, eastern brook)
Whitefish

12.12 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury or mortality to listed fish as a result of the proposed research activities.

Handled and release, according to NMFS methods and procedures all listed and unlisted fishes that are incidentally trapped during the collection of adult spring chinook salmon for broodstock at the Tumwater Dam and the Chiwawa River trapping facilities after enumeration and collection of biological information.

Handled and release (according to NMFS methods and procedures) all listed and unlisted fishes that are capture during the monitoring and evaluation for the program.

Section 13. Attachments and Citations

13.1 Attachments and Citations

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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:_____

Take Table 1. Estimated listed salmonid take levels by hatchery activity. See also Permit #1196 Annual Reports. Numbers submitted here are those allowed in the permit.

Spring Chinook

ESU/Population	Upper Columbia Spring Chinook
Activity	Wenatchee Basin/Chiwawa River Spring Program
Location of hatchery activity	Rock Island Hatchery Complex Facilities including Trapping sites on the Chiwawa and Wenatchee Rivers, spawning and rearing at Eastbank Hatchery and release from Chiwawa Ponds.
Dates of activity	May – May
Hatchery Program Operator	WDFW

Type of Take	Annual Take of Listed Fish by life Stage (number of fish)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass (a)			Research activities as spelled out in the permit.[2]	
Collect for transport (b)			379[1]	
Capture, handle, and release (c)			Dependent on yearly run[2]	
Capture, handle, tag/mark/tissue sample, and release (d)			Dependent on yearly run.[2]	
Removal (e.g., broodstock (e)			Same as section b.[2]	
Intentional lethal take (f)			Same as section b.[2]	
Unintentional lethal take (g)	Up to 10%[2]	Up to 25%[2]	Up to 10% of the adults held as spelled out in the permit.[2]	
Other take (specify) (h)		672,000^		

[1]Retain up to 379 spring chinook of combined Chiwawa River/Tumwater Dam collections, including jacks are allowed in the permit. . Adult collection will maintain, at a minimum, 33% wild origin fish. Collection of hatchery origin fish will be dependent upon hatchery origin collection numbers at Tumwater Dam.

[2]See Permit #1196 Annual reports.

[3]Loss from fingerling to release due to all causes including disease.

^ Rearing, transport and release to acclimation sites as specified in permit 1196.

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. See also Permit #1196 Annual Reports. Numbers submitted here are those allowed in the permit.

Steelhead

ESU/Population	Upper Columbia Steelhead
Activity	Wenatchee Basin/Chiwawa River Spring Program
Location of hatchery activity	Rock Island Hatchery Complex Facilities including Trapping sites on the Chiwawa and Wenatchee Rivers, spawning and rearing at Eastbank Hatchery and release from Chiwawa Ponds.
Dates of activity	May – May
Hatchery Program Operator	WDFW

Type of Take	Annual Take of Listed Fish by life Stage (number of fish)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass (a)			Up to 100 as spelled out in the permit.[1]	
Collect for transport (b)				
Capture, handle, and release (c)				
Capture, handle, tag/mark/tissue sample, and release (d)				
Removal (e.g., broodstock (e)				
Intentional lethal take (f)				
Unintentional lethal take (g)			Up to 9 as spelled out in the permit.[1]	
Other take (specify) (h)				

[1] Permit #1196.

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.

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[UU1]So me where we agreed to composite these stocks. Supplementation should be supporting locally adapted traits.