HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	Turtle Rock/Rocky Reach (Wells) Summer Chinook Program
Species or Hatchery Stock	Summer Chinook (*Oncorhynchus tshawytscha*)
Agency/Operator	Washington Department of Fish and Wildlife
Watershed and Region	Wenatchee Sub-basin/Columbia Cascade
Date Submitted	
Date Last Updated	September 1, 2005

Section 1: General Program Description

1.1 Name of hatchery or program.

Turtle Rock Summer Chinook Salmon Program

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

Upper Columbia River Summer chinook salmon (*Oncorhynchus tshawytscha*); summer-run component upstream of Priest Rapids Dam.

ESA Status: Not listed and not a candidate for listing. In the 1997 "Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California", NMFS indicated that summer/fall chinook salmon in this ESU were not in danger of extinction, nor were they likely to become so in the foreseeable future (Myers et al.1998).

1.3 Responsible organization and individuals.

Name (and title):	Rick Stilwater
	Eastbank/Wells Hatchery Complex Manager
Agency or Tribe:	Washington Department of Fish & Wildlife
Address:	13246 Lincoln Road, East Wenatchee, WA 98802
Telephone:	(509) 884-8301
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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
Public Utility District No. 1 (PUD) of Chelan County	Funding Source
Involved parties include those associated with the Columbia River Fish Management Plan and the U.S. v. Oregon court decision	Program Coordination, Co Management, and Policy

The summer chinook salmon run size enhancement program is funded by Public Utility District (PUD) No. 1 of Chelan County and PUD No. 1 of Douglas County for the purpose of mitigation for lost fish production as a result of fish mortality at the Rock Island, Rocky Reach, and Wells hydroelectric projects. The program is consistent with the Mid-Columbia Mainstem Conservation Plan ("MCMCP" - BAMP 1998), and the parties to this plan are involved in short and long-term production planning.

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

Funding Sources
Public Utility District (PUD) No. 1 of Chelan County

Operational Information	Number
Full time equivalent staff	2.75
Annual operating cost (dollars)	$529,000.00

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. Both Wells and Turtle Rock facilities are involved in these programs – Turtle Rock Hatchery: 2.75 Full Time Equivalent Staff/Budget = $529,000.00. a

1.5 Location(s) of hatchery and associated facilities.

Broodstock source	Wells Hatchery
Broodstock collection location (stream, RKm, sub-basin)	Wells Hatchery/Columbia River/RKm 861.0/Mid-Upper Columbia
Adult holding location (stream, RKm, sub-basin)	Wells Hatchery/Columbia River/RKm 861.0/Mid-Upper Columbia
Spawning location (stream, RKm, sub-basin)	Wells Hatchery/Columbia River/RKm 861.0/Mid-Upper Columbia
Incubation location (facility name, stream, RKm, sub-basin)	Wells Hatchery/Columbia River/RKm 861.0/Mid-Upper Columbia and Eastbank Hatchery/Columbia River/~RKm 790/Mid-Upper Columbia

Rearing location (facility name, stream, RKm, sub-basin)	Eastbank Hatchery/Columbia River/~RKm 790/Upper-Mid Columbia Eastbank Hatchery/Columbia River/~RKm 790/Mid-Upper Columbia; and Turtle Rock Annex/Columbia River/~RKm 790/Mid-Upper Columbia

1.6 Type of program.

Segregated Harvest Program

The Turtle Rock summer chinook salmon supplementation project will be operated to provide fish for harvest only with the intent to use only H x H spawners.

1.7 Purpose (Goal) of program.

The goal of the summer chinook artificial propagation program at Eastbank FH/Turtle Rock is to mitigate for the loss of summer chinook salmon adults and fishing opportunity (i.e., harvest) that would have been available in the region in the absence of the Rocky Reach hydroelectric project. This goal can be met through the use of the artificial environment of fish rearing facilities to increase the number of summer chinook adults that return to the basin by increasing survival at life-history stages where competitive or environmental bottlenecks occur. The goal to mitigate for habitat and harvest losses with a segregated "production program" is distinctly different than an integrated "supplementation program" designed to rebuild and increase natural production of indigenous stocks. Broodstock for the Rocky Reach/Turtle Rock program were initially from Priest Rapids FH, but the source was recently changed to Wells FH volunteers, to prevent mixing of the Upper Columbia summer chinook salmon GDU and the Hanford Reach fall chinook salmon GDU. These salmon are considered "fall run" however, to meet production objectives under the CRFMP.

Releases of hatchery fish into the mainstem Columbia River, rather than tributary releases are employed to minimize the impact on indigenous naturalized stocks. Limited capital expenditures, inadequate hatchery facilities, and the lack of a definitive acclimation water source to increase site fidelity have been and continue to be key issues affecting the efficacy of the Turtle Rock summer chinook production program. An acclimation facility would increase harvest potential and reduce stray rates into tributary populations. The return to the recreational harvest in the area of inundation impact will continue to be less than what may occur if a definitive acclimation water source were provided to enhance homing fidelity to the release site. The continued straying of Turtle Rock summer chinook into tributary spawning populations will likely continue without improved homing fidelity (See also Section 1.16).

1.8 Justification for the program.

The summer chinook propagation program is a component of the Mid-Columbia Hatchery Program, a part of an application for a 50-year multi-species Habitat Conservation Plan (HCP) and re-licensing agreement for the PUDs. This 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. Through the regional hatchery plan, the summer chinook artificial production program has been integrated with harvest management objectives to provide run size enhancement and fishery benefits. Biological risks to listed species in the Columbia Basin posed by hatchery chinook releases, including predation, competition, and disease transfer, are expected to be minimal.

Turtle Rock Satellite: Located on Turtle Rock Island 3 km upstream of Rocky Reach Dam, this facility operated as a spawning channel from 1961 to 1969 to compensate for inundated ocean-type chinook salmon spawning habitat by Rocky Reach Dam. It is now used as a rearing and release facility for yearling and sub-yearling ocean type chinook salmon.

Broodstock for the Rocky Reach/Turtle Rock program were initially from Priest Rapids FH, but the source was recently changed to Wells FH volunteers, to prevent mixing of the Upper Columbia summer chinook salmon GDU and the Hanford Reach fall chinook salmon GDU. These salmon are considered "fall run" however, to meet production objectives under the CRFMP. A comprehensive Evaluation/Conservation Plan is being implemented for the Rocky Reach FH yearling and sub-yearling chinook salmon programs. This plan has been developed to evaluate the program's adequacy in meeting mitigation requirements and to address special conditions described in the Incidental Take Permit for Snake River chinook and sockeye salmon. A major emphasis for evaluations at Rocky Reach FH is to determine rearing strategies that produce smolts that are ready to migrate to the ocean and spend a minimum amount of time in the freshwater environment. A portion of the Rocky Reach sub-yearling production will be marked with PIT tags to determine migration timing to McNary Dam and any other downstream monitoring sites equipped with PIT tag detectors. The Evaluation Plan calls for development of alternative rearing and release strategies based on results of PIT tag recoveries. Roughly 200,000 of both yearling and sub-yearling production releases are marked with an adipose fin clip, as well as coded wire tag, for survival evaluation and for discrimination between hatchery fish and natural fish.

The annual hatchery production goals are 200,000 yearling summer chinook and 1,600,000 sub-yearling summer chinook salmon for release from Turtle Rock Hatchery or above Rocky Reach Dam. Summer chinook salmon broodstock are not collected at Turtle Rock Hatchery. Currently, broodstock for the program is provided through collection of summer chinook salmon volunteers to the Wells Hatchery trap. Summer chinook adults collected at Wells Hatchery are a mixture of hatchery and a few natural-origin fish. All yearling summer chinook salmon released from Turtle Rock Hatchery are marked with an adipose-clip and CWT combination for visual identification and monitoring and evaluation
purposes. Progress is being made toward marking all sub-yearlings. Currently 200,000 "accelerated" (target release size of 25 fpp) sub-yearlings are marked and 200,000 "normal" release size (55 fpp) sub-yearlings are marked as a survival index group. Summer chinook salmon juveniles destined for release from Turtle Rock are transferred to the island ponds in October for six months of acclimation (April release of yearlings), or in April-May for three months of acclimation (June-July release of sub-yearlings). The long-term strategy for summer chinook salmon production in the region is to transfer production from mainstem facilities (particularly Turtle Rock) to acclimation sites on upper river tributaries (or near mainstem spawning habitat) (BAMP 1998). This action would presumably benefit local adaptation, smolt to adult survival rates, and natural productivity. A monitoring and evaluation plan for Turtle Rock releases will be developed by the HCP Hatchery Committees as previously described. Current post-release survival and contribution rates for Turtle Rock releases is monitored through the regional CWT recovery and evaluation program implemented by WDFW, the Tribes, and other fisheries management agencies in the Columbia basin.

Rocky Reach FH: Often referred to as the "Annex," Rocky Reach FH is located on the east bank of the Rocky Reach tailrace. This facility is funded by Chelan PUD, and has an incubation building (which contains 44 vertical incubator stacks) and eight 1,600 ft vinyl raceways. Water supply for the Annex is 6.2 cfs of water seeping around the grout wall at Rocky Reach Dam. This facility works in conjunction with the Turtle Rock Satellite, where the fish undergo final rearing and release. Water supply is 44 cfs of pumped river water to four segments of the channel (11 cfs per channel). Late summer temperatures often reach 20° C, which precludes rearing of yearlings at this site. The 200,000 yearlings (20,000 lbs at 10 fpp) are reared in the eight raceways at Rocky Reach on seepage, then

transferred in fall when water temperatures are tolerable (usually in October at 25 fpp), and released from Turtle Rock in April.

Authorization through Section 10(a)(1)(B) Permit Number #1347. WDFW and joint permit holders including the Public Utility District No. 1 of Chelan County (Chelan PUD), and the Public Utility District No. 1 of Douglas County (Douglas PUD) have authorization for this program through a Section 10 Permit allowing 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. The permit expires on October 22, 2013.

The Washington Department of Fish and Wildlife (WDFW), the Public Utility District No. 1 of Chelan County (Chelan PUD), and the Public Utility District No. 1 of Douglas County (Douglas PUD) are authorized to take endangered Upper Columbia River (UCR) steelhead (*Oncorhynchus mykiss*) and endangered UCR spring chinook salmon (*O. tshawytscha*) as a result of artificial propagation programs for the enhancement of UCR steelhead, as cited in the WDFW application and the *Anadromous Fish Agreement and Habitat Conservation Plan (HCP)Wells hydroelectric Project FERC License No. 2149* with Douglas PUD for the operation of Wells Dam (DPUD 2002), the *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 the *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), subject to the provisions of Section 10(a)(1)(B) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. §§ 1531-1543), NOAA's National Marine Fisheries Service (NMFS) regulations governing ESA-listed species permits (50 CFR Parts 222-226), and the conditions hereinafter set forth.

The permit authorizes the WDFW, the Chelan PUD, the Douglas PUD annual incidental take of adult and juvenile, endangered, naturally produced and artificially propagated, UCR spring chinook salmon and UCR steelhead of ESA-listed species associated with the implementation of non-ESA-listed salmon artificial propagation programs in the UCR region. The programs are intended to supplement naturally spawned unlisted summer chinook salmon, fall chinook salmon, and sockeye salmon (*O. nerka*) production occurring upstream from the vicinity of Priest Rapids Dam on the mainstem Columbia River, including the mainstem Columbia River and the Wenatchee, Methow, and Okanogan Rivers and their tributaries. The artificial propagation programs exist to mitigate for lost salmon, or lost salmon productivity, resulting from the construction and operation of hydroelectric dams on the mainstem Columbia River. With the exception of the Priest Rapids fall chinook salmon program, all of the programs authorized in this permit are required mitigation in the three long-term HCP agreements mentioned above. The artificial propagation programs may lead to incidental take of migrating ESA-listed adult spring chinook salmon and steelhead during unlisted salmon broodstock trapping activities, and incidental take of rearing and emigrating ESA-listed juvenile spring chinook salmon and steelhead resulting from the release of artificially-propagated unlisted salmon juveniles into the natural environment, and during monitoring and evaluation activities of the hatchery programs that occur in the natural environment. Limitations on unlisted adult salmon broodstock collection locations and timing; limits on the number, timing, and location of juvenile salmon releases; and operational guidelines applied to minimize the risks of disease transmission, water quality impairment, and fish loss through hatchery fish screening or water withdrawals for facility operations are some strategies that the WDFW, the Chelan PUD, and the Douglas PUD will employ to minimize risks to listed fish. Unlisted salmon survival and straying levels will be monitored through externally marking hatchery fish, and/or through internal coded wire or passive integrated transponder (PIT) tagging of a representative proportion of annual juvenile fish releases. The Chelan PUD and the Douglas PUD, as joint permit holders with the WDFW, have specific conditions relating

to their involvement and obligation under the HCPs and the permit. The WDFW as the primary operator of the hatchery facilities and as a managing agency of the fish resources of the state, also has specific conditions and responsibilities. The failure of one permit holder to satisfy their conditions may result in the loss of take authorization for all permit holders. Thereby, an interdependent and cooperative relationship should be encouraged in carrying out the authorized activities.

Unlisted salmon artificial propagation program activities will include:

- The collection of broodstock through trapping operations at: Wells Dam for Methow and Okanogan River summer chinook salmon populations, Wells Hatchery for summer chinook salmon releases from Wells and Turtle Rock hatcheries, Dryden and Tumwater Dams for Wenatchee River summer chinook salmon and Wenatchee sockeye salmon, and Priest Rapids Hatchery for Priest River hatchery-origin fall chinook salmon.
- The holding and artificial spawning of collected adults at Wells, Eastbank, and Priest Rapids Hatcheries, and Lake Wenatchee Net Pens.
- The incubation and propagation from the fertilized egg through the fingerling, pre-smolt or smolt life stage at the Wells, Eastbank, and Priest Rapids Hatchery complex facilities.
- The transfer of summer chinook salmon and sockeye salmon fingerlings or pre-smolts from the hatcheries for rearing at facilities in the Wenatchee, Methow, and Okanogan Rivers' watersheds, and to net-pens in Lake Wenatchee.
- The release of summer chinook salmon, fall chinook salmon, and sockeye salmon smolts into the Wenatchee, Methow, and Okanogan Rivers' basins, and into the mainstem Columbia River from the hatcheries, acclimation ponds, and net-pens on those systems.
- The monitoring and evaluation of these artificial propagation programs in the natural environment through activities such as redd counts and carcass surveys, and formal monitoring and evaluation plans to be developed by the HCP Hatchery Committees as called for in the HCPs.

Included in the incidental take are conditions of the permit including:

Section A. Take Description and Levels
Section B. Production Levels
Section C. Program Management and Operating Conditions
Section D. Reports and Annual Authorization
Section E. Penalties and Sanctions

Operation of WDFW Facilities and Practices:

- 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".

"Performance Standards" are designed to achieve the program goal/purpose, and are generally measurable, realistic, and time specific. The NPPC "Artificial Production Review" document attached with the instructions for completing the HGMP presents a list of draft "Performance Standards" as examples of standards that could be applied for a hatchery program. If an ESU-wide hatchery plan including your hatchery program is available, use the performance standard list already compiled.

See Section 1.10 below.

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 referenced above 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:

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 $_{\text{Supplemented population}}$ > Δ 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 $_{\text{Year x}}$ > NRR $_{\text{Year x}}$ Ho: HRR $\geq$ 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 $_{\text{Hatchery fish}}$ < 5% of total brood return Ho: Stray hatchery fish < 5% of spawning escapement of other	Monitor and evaluate hatchery stray rates and proportional contribution to natural spawning aggregates.

	independent populations. Ho: Stray hatchery fish < 10% of spawning escapement of any non-target streams within independent population.	
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 fingerling smolt size (55 fish/lb), accelerated fingerlings (25 fish/lb) and yearling smolt-size (8 fish/lb). All fish are adipose fin clipped and CWT 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 - WAG-5004.	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 have been 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. 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 lots of fish including nets, crowders, boots, raingear, etc.	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.
5. Artificial production facilities are operated in compliance with all applicable fish health guidelines, facility operation standards and protocols including IHOT, Co-	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	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

managers Fish Health Policy and drug usage mandates from the Federal Food and Drug Administration	stocks and to produce healthy smolts that will contribute to the goals of this facility.	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 lots of fish including nets, crowders, boots, raingear, etc.	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.	
7. Broodstock collection and juvenile hatchery releases minimize ecological effects on listed wild fish.	Summer chinook reared to sufficient sizes 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). All listed fish 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. Listed fish trapped in excess of broodstock collection goals will be released upstream or returned to natal streams immediately. 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. Downstream juvenile smolt traps can 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 are not collected at Turtle Rock but part of the collection at Wells. Current protocols for the summer chinook programs allow for the annual collection of 980 (Wells FH volunteers), equally divided among sexes including jacks that are used for Turtle Rock Hatchery Programs. Egg take goal is 2,155,900 for Turtle Rock programs while combined with Wells program it is a combined 3,000,000 eggs (FBD 2005-06).

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

Original goals from Turtle Rock Hatchery into the mainstem Columbia River was 200,000 yearling juveniles at 10 ffp released in April, and 1,600,000 sub-yearling juveniles at 50 ffp in June. Current releases have been modified from original goals to current levels below:

Age Class	Max. No.	Size (ffp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Water-shed	Eco-province
Finger-ling	628,000	55 (Non-Accelerated Growth)	July 1	Columbia River	793	Mid-Upper Columbia	Columbia Cascade
	450,000	25 (Accelerated Growth)					
Year-ling	200,000	8	Mid-April	Columbia River	793	Mid-Upper Columbia	Columbia Cascade

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

In the Columbia River, ocean-type chinook salmon released as yearlings have consistently survived better than those released as sub-yearlings In the Columbia River, the benefits of rearing juveniles through a yearling stage include (1) improved passage through hydroelectric dams, through coincidental timing of releases with increased flows and spill (Raymond 1988); (2) better fish guidance efficiency of yearlings at the dams because of behavioral and buoyancy changes (Giorgi et al. 1988); (3) decreased susceptibility to predators (Poe et al. 1991); and (4) improved swimming performance of larger smolts (Park 1969). Based upon smolt production numbers to necessary to achieve hatchery compensation objectives, the difference in production required between yearling and sub-yearling ocean-type chinook salmon is on the order of 0.24. In other words, for every 1,000 sub-yearling summer chinook smolts to be produced for compensation, 240 yearling smolts could be produced in lieu of the sub-yearlings. This ratio was derived from observed differences in survival between yearling and sub-yearling releases from Wells FH. The appropriate mix of yearling and sub-yearling smolts has been evaluated through the Mid Columbia Hatchery Plan to minimize the risk of this increased hatchery production on the existing natural production. It is assumed that current program will have similar performance of SAR, and provide harvestable numbers according to the settlement agreements.

SARs for yearling releases have been increasing in the late 1990's (Table 1). A comparison of other summer chinook programs of yearling releases are provided in Table 2.

Table 1. Data available for fingerling and yearling SARs to brood year 1999. Data from the APRE website and RMIS (1998 & 1999).

Brood Year	Turtle Rock Sub-yearling Releases	Turtle Rock Yearling Releases
	Smolt to Adult Survival (%) 0+	Smolt to Adult Survival (%)
1995	0.06	0.69
1996	0.05	0.75
1997	0.002	2.35
1998	0.01	2.57
1999	0.22	0.65*
2000	Na	Na
2001	Na	Na
2002	Na	Na
2003	Na	Na

*Preliminary numbers only.

Table 2. Estimated survival rates for WDFW summer yearling smolt releases from Wells, Turtle Rock, Wenatchee, Methow and Okanogan River systems and sub-yearling releases from Turtle Rock. Years 1976-1989 are taken from the Mid- Columbia Hatchery Plan (BAMP 1998) with recent data from brood years 1995- 1999 derived from RMIS.

Hatchery	**Age at Release**	**Release years**	**Release years survival rate (%)**	**Brood Years 1995 – 1999**	**Release years survival rate (AVG %)**
Rocky Reach (Turtle Rock)	1+	1984-1989	1.366	0.69 (1995) 0.76 (1996) 2.35 (1997) 2.57 (1998) 0.65 (1999)*	1.404%
Rocky Reach (Turtle Rock)	0+	Na	Na	0.06 (1995) 0.05 (1996) 0.002 (1997) 0.01 (1998) 0.22 (1999)*	0.0685%
Wells	1+	1976-1989	0.410	0.40 (1995) 0.46 (1996) 2.78 (1997) 2.19 (1998) 0.39 (1999)*	1.244%

Methow River (Carlton Pond)	1+	Na	Na	0.06 (1995) 0.03 (1996) 0.16 (1997) 1.82 (1998) 0.005 (1999)*	0.383%
Similka-meen Pond	1+	Na	Na	0.48 (1995) 0.009 (1996) 3.10 (1997) 2.63 (1998) 0.27 (1999)*	1.297%
Wenat-chee (Dryden Pond)	1+	Na	Na	0.22 (1995) 0.09 (1996) 1.84 (1997) 1.12 (1998) 0.18 (1999)*	0.69%

*Preliminary numbers only.

Escapement:
Returns to the upper Columbia to Wells Dam have been increasing recently and reflected in the escapement to the Methow and Okanogan River systems (Table 4). The most recent five-year average annual escapement for summer chinook at wells dam is 38,807. This compares with a 5 year average of only 4,027 for 1989-1993 and a 5 year average of 4,832 for the period from 1994-1998 (Table 3).

Table 3. Methow/Okanogan Escapement from 1989 – 2003 based on adult escapement over Wells Dam.

Return Year	Number of Adults	Return Year	Number of Adults
1989	4,800	1998	5,316
1990	4,160	1999	10,336
1991	2,892	2000	13,443
1992	3,491	2001	47,314
1993	4,795	2002	69,311
1994	8,001	2003	53,632
1995	4,238	2004	NA
1996	3,307	2005	NA
1997	3,298		

Table 4. Upper Columbia natural summer chinook spawning escapement estimates (return years1979-1991 from WDF and WDW 1993). Peak number of summer chinook redds estimates or counted during spawning surveys on the Wenatchee, Methow, Okanogan and Similkameen Rivers

Year	**Wenatchee**	**Methow**		**Okanogan**		**Similkameen**	
	Spawning Estimates	Aerial	Ground	Aerial	Ground	Aerial	Ground
1980	8,995	345	-	118	-	172	-
1981	4,515	195	-	55	-	121	-
1982	4,113	142	-	23	-	56	-
1983	3,937	65	-	36	-	57	-
1984	8,420	162	-	235	-	301	-
1985	9,185	164	-	138	-	309	-
1986	10,021	169	-	197	-	300	-
1987	9,831	211	-	201	-	164	-
1988	10,389	123	-	113	-	191	-
1989	12,764	126	-	134	-	221	370
1990	9,343	229	-	88	47	94	147
1991	7,144	-	153	55	64	68	91
1992	9,312	-	107	35	53	48	57
1993	7,469	-	154	144	162	152	288
1994	8,006	-	310	372	375	463	777
1995	6,178	-	357	260	267	337	616
1996	4,879	-	181	100	116	252	419
1997	4,719	-	205	149	158	297	486
1998	3,984	-	225	75	88	238	276
1999	4,376	-	448	222	369	903	1,275
2000	4,448	-	500	384	549	549	993
2001	9,142	-	675	883	1,108	865	1,540
2002	Na	-	2,013	1,958	2,667	2,000	3,358
2003	Na	-	1,624	1,099	1,035	103	378
2004	Na	-	973	1,310	1,327	2,127	1,660
2005	Na	-	-	-	-	--	

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

The first year of operation for this hatchery was 1961 . The WDFW hatcheries currently producing summer chinook smolts were constructed in 1967 (Wells), 1989 (Eastbank), and 1990 (Similkameen Pond, Dryden Pond, and Carlton Pond).

1.14 Expected duration of program.

The supplementation program will continue with the objective of mitigating for the loss of summer chinook salmon productivity caused by hydroelectric dams in the Columbia River Basin; in particular the Rock Island, Rocky Reach, and Wells hydroelectric projects.

1.15 Watersheds targeted by program.

The targeted watershed is the mainstem Columbia River below Rocky Reach Dam.

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

WELLS SUMMER CHINOOK (Turtle Rock and Eastbank FH)

1.16.1 OVERVIEW

Eastbank summer chinook hatchery program level is 1,820,000 smolts (200,000 yearling smolts (10 fpp) and 1,620,000 sub-yearling smolts (50 fpp). Historically, the program has produced 1,278,000 smolts (200,000 yearling @ 10 fpp), 450,000 accelerated sub-yearling (30 fpp) and 628,000 sub-yearling smolts (50 fpp). The program is the result of mitigation/compensation agreements for mainstem habitat losses and lost fishing opportunity associated with the construction of Rocky Reach Dam.

The goal of the summer chinook artificial propagation program at Eastbank FH/Turtle Rock is to mitigate for the loss of summer chinook salmon adults and fishing opportunity (i.e., harvest) that would have been available in the region in the absence of the Rocky Reach hydroelectric project. This goal can be met through the use of the artificial environment of fish rearing facilities to increase the number of summer chinook adults that return to the basin by increasing survival at life-history stages where competitive or environmental bottlenecks occur. The goal to mitigate for habitat and harvest losses with a segregated "production program" is distinctly different than an integrated "supplementation program" designed to rebuild and increase natural production of indigenous stocks. Releases of hatchery fish into the mainstem Columbia River, rather than tributary releases are employed to minimize the impact on indigenous naturalized stocks. Limited capitol expenditures, inadequate hatchery facilities, and the lack of a definitive acclimation water source to increase site fidelity have been and continue to be key issues affecting the efficacy of the Eastbank summer chinook production program.

Broodstock are collected from existing facilities at the Wells FH volunteer channel and are adequate in most years. Adult holding and spawning occurs at the Wells FH. Unfertilized and/or eyed-eggs are transferred to Eastbank FH. Hatching and rearing occur at the Eastbank FH. The sub-yearling component of the program is transferred to the Rocky Reach Annex facility and reared until May and eventually transferred to the Turtle Rock facility for final rearing and release (July). The yearling production component is reared at the Rocky Reach Annex until transfer (October) to the Turtle Rock facility for final rearing and release (April-May). Both yearling and sub-yearling production groups are released directly from the Turtle Rock facility into the Columbia River. Water quality, quantity, and rearing space constraints at the Rocky Reach Annex facility limit the production level and fish quality associated with the Rocky Reach Annex /Turtle Rock Hatchery summer chinook production. The lack of definitive acclimation site/water may also limit the adult recovery and fishery potential (increased stray rate), particularly in the upper Columbia River Region.

1.16.2 POTENTIAL ALTERNATIVES

ALTERNATIVE 1

The Turtle Rock/Rocky Reach Annex summer chinook program will continue to produce fewer sub-yearling chinook than planned production. Hatchery rearing environments will continue to be inadequate to provide programmed production. Supplementation program production will continue to be impacted by incorporating the Eastbank/Turtle Rock yearling production into the rearing scheme at Eastbank, rather than at the Rocky Reach Annex where it was originally planned. The return to the recreational harvest in the area of inundation impact will continue to be less than what may occur if a definitive acclimation water source were provided to enhance homing fidelity to the release site. The continued straying of Turtle Rock summer chinook into tributary spawning populations will likely continue without improved homing fidelity.

ALTERNATIVE 2 (WDFW endorsed)
Modify or construct rearing facilities specific to provide programmed production, consistent with fish health guidelines for flow and density indices, including those specified for variable ELISA level production groups. Provide a definitive acclimation water source to enhance homing fidelity to point of release (e.g., Chelan River acclimation).

Programmed production levels would be met if facilities and water were adequate. Adequate facilities would also improve smolt quality and subsequent smolt to adult survival rates. An acclimation facility would increase harvest potential and reduce stray rates into tributary populations. Capital expenditures of facility modification and acclimation site would be substantial.

ALTERNATIVE 3 (WDFW endorsed)

Modify or construct rearing facilities specific to provide programmed production, consistent with fish health guidelines for flow and density indices, including those specified for variable ELISA level production groups. Provide a definitive acclimation water source (chemical drip) to enhance homing fidelity to point of release.

PROS AND CONS

Programmed production levels would be met if facilities and water were adequate. Adequate facilities would also improve smolt quality and subsequent smolt to adult survival rates. An acclimation facility would increase harvest potential and reduce stray rates into tributary populations. Capital expenditures of facility modifications would be substantial. Cost savings would be significant if chemical imprinting during rearing was an effective alternative to acclimation ponds. Multiple chemical drip locations could be used to increase harvest opportunities.

ALTERNATIVE 4

Convert existing program production of 1,620,000 sub-yearlings to 400,000 yearling chinook. New program level would be 600,000 yearling smolts.

PROS AND CONS

The disproportionate survival rate of yearling versus sub-yearling smolts would result in an increase adult fish to the upper Columbia River. Subsequently, an increase in harvest opportunity would be realized. However, without a higher degree of site fidelity the increased risk of additional adults straying into tributary populations is unacceptable. There is also a potential risk (unknown) to the population if a dominant life history strategy is eliminated for the hatchery program (i.e., shifting from a sub-yearling to a yearling life history for 100% of the production).

ALTERNATIVE 5

Convert existing program production of 1,620,000 to 400,000 yearling chinook of upper basin stock origin (i.e., Methow/Okanogan stock).

PROS AND CONS

A program change from a segregated program utilizing a “production” strategy to an integrated program utilizing supplementation strategies may reduce potential risks of more domesticated stocks (“production stocks”) commingling with naturalized and supplemented stocks in tributaries as a

result of straying. The shift in strategies would increase the broodstock demand of naturalized and supplemented stocks (i.e. additional adults will be required). Without additional acclimation ponds on the Okanogan River hatchery adults will return to areas where spawning habitat is already fully seeded. In addition, without significant harvest of excess hatchery adults, the proportion of hatchery fish on the spawning grounds would be too high. Higher escapement may acerbate the adult pre-spawn and juvenile mortality associated with significant over-escapement.

Shifting the production to upper basin stock will reduce the harvest opportunity in the immediate area of impact (i.e., Rocky Reach pool), but would an increased harvest opportunity in the upper basin area (e.g. Wells pool and Okanogan River). Potential risk to population life history traits may occur as a result of shifting from a sub-yearling to a yearling life history for 100% of the production.

1.16.3 POTENTIAL REFORMS AND INVESTMENT

INVESTMENT OR REFORM 1

Providing 100% of the programmed production associated with Rocky Reach Dam inundation mitigation will provide increased angling opportunity in the affected area through increased production of high quality sub-yearling smolts. However, to provide full program production, without impacting fish production associated with the Mid-Columbia HCP's, production will likely require construction of a new facility or significant modifications to existing facilities. Chelan PUD is currently conducting a hatchery facilities review and evaluation to identify the status of existing hatchery facilities (meeting program objectives). Speculation as to the extent of new construction/modification and associated cost to meet full program is premature at this time.

INVESTMENT OR REFORM 2

Providing a definitive water source and increased homing fidelity for Turtle Rock summer chinook would reduce straying and improve adult site fidelity. Adult returns to a specific location will provide enhanced fishing opportunity and reduce the potential for this production to stray into tributary habitats and commingle with chinook stocks managed for increased natural production (integrated supplemented populations). Improved homing fidelity will improve the programs ability to operate as a "segregated" production program, minimizing potential impact (harvest and ecological) to supplemented populations.

Homing fidelity may be improved through inclusion of definitive water sources, including but not limited to: (1) providing a rearing water source distinctly different than upper Columbia River water (possibly Chelan River water) and (2) chemically enhanced water supply (e.g., morphaline). The efficacy of either method should be investigated to provide the greatest benefit at least cost.

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 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 1196 Permit Type: Artificial production of upper Columbia spring chinook. Expires Dec 31, 2007. 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).

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: **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 impact1 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.

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

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

Identify the NMFS ESA-listed population(s), that will be directly affected by the program.
None.

Identify the NMFS ESA-listed population(s), that may 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. The ESU includes all naturally spawned populations of chinook salmon in all river reaches accessible to chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River. Chinook salmon (and their progeny) from the following hatchery stocks are considered part of the listed ESU: Chiwawa River (spring run); Methow River (spring run); Twisp River (spring run); Chewuch River (spring run); White River (spring run); and Nason Creek (spring run).

Upper Columbia River ESU summer steelhead trout (*Oncorhynchus mykiss).* On August 18, 1997 summer steelhead in the Upper Columbia River ESU were listed as Endangered under the ESA. Listed as an endangered species on Aygust 18, 1997. The ESU includes all naturally spawned populations of steelhead (and their progeny) in streams in the Columbia River Basin upstream from the Yakima River, Washington, to the U.S.-Canada border. Wells Hatchery stock steelhead are also part of the listed ESU.

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. The natural summer chinook salmon populations in the upper Columbia Basin are healthy (Wenatchee River) or depressed (Methow River and Okanogan Basin) in status (WDF et and WDW 1993). The Upper Columbia River summer/fall chinook ESU including these populations has been judged as not warranting listing under ESA protective provisions (Myers et al. 1998).

- **Provide the most recent 12 year (e.g. 1988-present) progeny to parent ratios, survival data by life stage, or other neasures 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 spwning 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 5).

Table 5. 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 3049 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.

UCR 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.

UCR 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 6. 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 Run
1998	2,849	92%	234	8%	3,083
1999	3,511	89%	447	11%	3,958
2000	6,142	92%	541	8%	6,683
2001	18,034	95%	889	5%	18,923
2002	9,098	93%	706	7%	9,804

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 (2003) 716 (Table 8). 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 7).

Table 7. 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 8. Estimates of the number of natural-origin spring chinook returning to sub-basins 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 spwning grounds, if known. Indicate sources of these data.

UCR Steelhead:

See Table 6.

UCR Spring chinook:

Table 9. Annual total redd counts and proportion of artificially propagated to natural origin spring chinook salmon by tributary basin (Andrew Murdoch, WDFW, pers. comm.).

	Return Year								
Basin	**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	
Nason Creek	27	7	33	55	29	8	100	367	
White River	3	2	12	15	5	1	8	93	
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	
Nason Creek	0.23	0	0.33	0.63	0.19	0	0.24	0.61	
White River	0	0	0	0	0	0	0	0.21	
Entiat Basin [c]	0	0	0.20	??	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	.014	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.

Activities approved through Section 10 Incidental Take Permit 1347 authorizes the WDFW, the Chelan PUD, the Douglas PUD annual incidental take of adult and juvenile, endangered, naturally produced and artificially propagated, UCR spring chinook salmon and UCR steelhead of ESA-listed species associated

with the implementation of non-ESA-listed salmon artificial propagation programs in the UCR region. The programs are intended to supplement naturally spawned unlisted summer chinook salmon, fall chinook salmon, and sockeye salmon (*O. nerka*) production occurring upstream from the vicinity of Priest Rapids Dam on the mainstem Columbia River, including the mainstem Columbia River and the Wenatchee, Methow, and Okanogan Rivers and their tributaries.

Unlisted salmon artificial propagation program activities will include:

- The collection of broodstock through trapping operations at: Wells Dam for Methow and Okanogan River summer chinook salmon populations, Wells Hatchery for summer chinook salmon releases from Wells and Turtle Rock hatcheries, Dryden and Tumwater Dams for Wenatchee River summer chinook salmon and Wenatchee sockeye salmon, and Priest Rapids Hatchery for Priest River hatchery-origin fall chinook salmon.
- The holding and artificial spawning of collected adults at Wells, Eastbank, and Priest Rapids Hatcheries, and Lake Wenatchee Net Pens.
- The incubation and propagation from the fertilized egg through the fingerling, pre-smolt or smolt life stage at the Wells, Eastbank, and Priest Rapids Hatchery complex facilities.
- The transfer of summer chinook salmon and sockeye salmon fingerlings or pre-smolts from the hatcheries for rearing at facilities in the Wenatchee, Methow, and Okanogan Rivers' watersheds, and to net-pens in Lake Wenatchee.
- The release of summer chinook salmon, fall chinook salmon, and sockeye salmon smolts into the Wenatchee, Methow, and Okanogan Rivers' basins, and into the mainstem Columbia River from the hatcheries, acclimation ponds, and net-pens on those systems.
- The monitoring and evaluation of these artificial propagation programs in the natural environment through activities such as redd counts and carcass surveys, and formal monitoring and evaluation plans to be developed by the HCP Hatchery Committees as called for in the HCPs.

Trapping Operations: No adult fish are captured at the Turtle Rock facility, and no effects on listed chinook or steelhead are expected from the operation. Summer/fall chinook eggs are transferred from broodstock captured as volunteers to Wells Hatchery for the sub-yearling and yearling programs. The lack of a hatchery return site for chinook released from this facility may lead to straying of fall chinook adults into spawning areas that are important for spring chinook and steelhead. Because of temporal separation between wild spring chinook, steelhead and fall chinook spawning, and the different spawning habitat requirements for the species, it is unlikely that straying of Turtle Rock chinook to steelhead or spring chinook spawning areas will have a significant effect on steelhead or spring chinook spawning activity or success.

Genetic and Ecological Effects on Natural Populations: The genetic risks to naturally produced populations from artificial propagation include reduction in the genetic variability (diversity) among and within populations, genetic drift, selection, and domestication which can contribute to a loss of fitness for the natural populations (Hard *et al.*1992; Cuenco *et al.* 1993; NRC 1996; and Waples 1996). Disease interactions between hatchery fish and listed fish in the natural environment may be a source of pathogen transmission. Because the pathogens responsible for diseases are present in both hatchery and natural-origin populations, there is some uncertainty associated with determining the extent of disease transmission from hatchery fish (Williams and Amend 1976; Håstein and Lindstad 1991). 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. 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 for space and cover in the Methow and Ojkanogan River 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 salmon and steelhead hatcheries are designed to limit adverse ecological interactions through minimizing the duration of interaction between newly liberated hatchery salmon and steelhead and naturally produced fish.

Competition, predation, cannibalism, and residualism:
Direct competition for food and space between hatchery and natural fish may occur in spawning and/or rearing areas, the migration corridor, and in 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 (NMFS 1995). 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 natural fish. Release of hatchery smolts that are physiologically ready to migrate is expected to minimize competitive interactions as they should quickly migrate out of the spawning and rearing areas. Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size such that smoltification occurs within nearly the entire population, which reduces retention time in the streams after release (Bugert et al. 1991). Rearing on parent river water, or acclimation for several weeks to parent river water, also contributes to the smoltification process and reduced retention time in the streams. Adult hatchery fish that stray to natural spawning areas, rather than return to the hatchery, may also be competing for spawning gravel. However, when spawning populations are at depressed levels, the degree of this impact should be small: there is thought to be a relationship between high spawner density and greater egg loss in the natural environment (Chebanov 1991). Stray hatchery adults may also breed with native fish, potentially altering genetic fitness and influencing their ability to survive in the ecosystem . Hatchery fish may prey upon natural fish. Due to their location, size, and time of emergence, newly emerged chinook salmon fry are likely to be the most vulnerable to predation by hatchery released fish. Their vulnerability is believed to be greatest as they emerge and decreases somewhat as they move into shallow, shoreline areas (USFWS 1994). migration out of hatchery release areas and foraging inefficiency of newly released hatchery smolts may minimize the degree of predation on chinook salmon fry (USFWS 1994). Rearing and acclimation pond management strategies in the Mid-Columbia Hatchery Program will be designed to reduce impacts to natural fish. Predation by hatchery fish on natural-origin smolts is less likely to occur than predation on fry. USFWS (1994) presented information indicating salmonid predators are generally thought to prey on fish approximately 1/3 or less their length. Coho salmon and chinook salmon, after entering the marine environment, generally prey upon fish one-half their length or less and consume, on average, fish that is less than one-fifth their length (Brodeur 1991). Consequently, predation by hatchery fish on natural salmon and steelhead smolts in the migration corridor is believed to be low. In general, predation on natural fish may be reduced by using appropriate fish cultural practices. Hatchery fish may prey upon listed fish. Due to their location, size, and time of emergence, newly emerged Chinook salmon fry are likely to be most vulnerable to predation by hatchery released fish. Their vulnerability is believed to be greatest as they emerge and decreases somewhat as they move into shallow, shoreline areas (USFWS 1994). Emigration out of hatchery release areas and foraging inefficiency of newly released hatchery smolts may minimize the degree of predation on Chinook salmon fry (USFWS 1994). Hatchery salmonids that do not emigrate after release are said to have residualized. These fish that residualize can adversely affect naturally produced fish through competition and predation. Chinook salmon though do not tend to residualize (Groot and Margolis 1991).

Straying No adult fish are captured at the Turtle Rock facility, and no effects on listed chinook or steelhead are expected from the operation. Summer/fall chinook eggs are transferred from broodstock captured as volunteers to Wells Hatchery for the sub-yearling and yearling programs. The lack of a hatchery return site for chinook released from this facility may lead to straying of fall chinook adults into spawning areas that are important for spring chinook and steelhead. Because of temporal separation between wild spring chinook, steelhead and fall chinook spawning, and the different spawning habitat requirements for the species, it is unlikely that straying of Turtle Rock chinook to steelhead or spring chinook spawning areas will have a significant effect on steelhead or spring chinook spawning activity or success.

Monitoring:

Associated monitoring Activities:

Associated monitoring Activities:
The monitoring and evaluation of these artificial propagation programs in the natural environment through activities such as redd counts and carcass surveys, and formal monitoring and evaluation plans are to be developed by the HCP Hatchery Committees as called for in the HCPs. WDFW as per permit conditions will be submitting annual reports that will detail these activities.

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).

Hatchery activities are covered under Incidental take Permit 1347 for unlisted salmon propagation program activities including:

- The collection of broodstock through trapping operations at: Wells Dam for Methow and Okanogan River summer chinook salmon populations, Wells Hatchery for summer chinook salmon releases from Wells and Turtle Rock hatcheries, Dryden and Tumwater Dams for Wenatchee River summer chinook salmon and Wenatchee sockeye salmon, and Priest Rapids Hatchery for Priest River hatchery-origin fall chinook salmon.
- The holding and artificial spawning of collected adults at Wells, Eastbank, and Priest Rapids Hatcheries, and Lake Wenatchee Net Pens.
- The incubation and propagation from the fertilized egg through the fingerling, pre-smolt or smolt life stage at the Wells, Eastbank, and Priest Rapids Hatchery complex facilities.
- The transfer of summer chinook salmon and sockeye salmon fingerlings or pre-smolts from the hatcheries for rearing at facilities in the Wenatchee, Methow, and Okanogan Rivers' watersheds, and to net-pens in Lake Wenatchee.
- The release of summer chinook salmon, fall chinook salmon, and sockeye salmon smolts into the Wenatchee, Methow, and Okanogan Rivers' basins, and into the mainstem Columbia River from the hatcheries, acclimation ponds, and net-pens on those systems.
- The monitoring and evaluation of these artificial propagation programs in the natural environment through activities such as redd counts and carcass surveys, and formal monitoring and evaluation plans to be developed by the HCP Hatchery Committees as called for in the HCPs

Because of the inherent biological attributes of aquatic species, such as salmon and steelhead, the dimensions and variability of the Columbia River system and tributaries, and the operational complexities of hatchery actions, determining precise incidental take levels of ESA-listed species attributable to the hatchery activities is not possible at present. The existence of concurrent WDFW broodstock collection programs for listed steelhead at Wells Dam, Dryden Dam, and Tumwater Dam (previously authorized by NMFS through Section 10 direct take Permit 1395), and for listed spring

chinook salmon at Tumwater Dam (previously authorized by NMFS through Section 10 direct take Permit 1196), further complicates the ability to identify incidental take occurring through the unlisted salmon programs. Indirect takes from hatchery releases such as predation and competition is highly uncertain and dependant on a multitude of factors (i.e. data for population parameters - abundance, productivity and intra species competition) and although HGMPs discuss our current understanding of these effects, it is not feasible to determine indirect take (genetic introgression, density effects, disease, competition, predation) due to these activities. Estimated annual levels of take or take tables for these activities cannot be submitted with this document.

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 (#1347).

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 (#1347).

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.

A comprehensive ESU-wide plan for the propagation of UCR summer/fall Chinook does not exist. Fishery co-managers have prepared a draft "Biological Assessment and Management Plan, Mid-Columbia River Hatchery Program" (Bugert 1998). This conceptual artificial production plan (BAMP) was developed as a component of a Mid-Columbia Habitat Conservation Plan, but has not yet been formally agreed upon and adopted. Production increases are to be consistent with conservation of low risk, natural populations and recovery of listed species. A phased approach is to be used to minimize deleterious effects of collecting broodstocks upon natural populations and to allow monitoring of program development.

The summer chinook production programs are fully consistent with standards and guidelines set forth in the MCMCP's "Mid-Columbia Hatchery Plan" (BAMP 1998). The plan presents hatchery programs that have been jointly developed and, in most cases, agreed to by the parties to the MCMCP, which includes WDFW, NMFS, USFWS, Chelan and Douglas PUDs, and the Tribes.

The summer chinook artificial propagation program is a component of the Mid-Columbia Hatchery Program, a part of an application for a 50-year multi-species Habitat Conservation Plan (HCP) and relicensing agreement for the PUDs. This 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. Through the regional hatchery plan, the summer chinook artificial production program has been integrated with harvest management objectives to provide run size enhancement and fishery benefits. Biological risks to listed species in the Columbia Basin posed by hatchery chinook releases, including predation, competition, and disease transfer, are expected to be minimal.

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.

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. 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 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). These HCPs are long term agreements between NMFS, the PUDs, the WDFW, the USFWS, the Colville Tribes, and other stakeholders. They provide the PUDs with some degree of certainty for the long-term operation of these projects and require the PUDs to provide mitigation in the form of a tributary fund for habitat improvement projects, and artificial propagation programs to mitigate for unavoidable loss of natural fish production due to habitat inundation and passage mortality at the projects. The HCPs were developed to protect five species of anadromous salmonids, including endangered UCR steelhead and UCR spring chinook salmon. The HCP agreements restrict the PUDs and NMFS from changing the artificial propagation production level during the period of this permit. The HCPs provide for HCP Hatchery Committees that may adjust the operation or implementation strategy of the programs based on new scientific data, changes in NMFS hatchery policy, or recommendations of the HCP Hatchery Committees.

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.

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.

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.

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

Summer chinook from the region are only harvested incidentally in lower Columbia River fisheries directed at other species, and no directed commercial fisheries on upper Columbia summer-run fish have occurred in the mainstem since 1964 (BAMP 1998). Ceremonial and subsistence fisheries by the Colville Tribe in waters upstream of Rock Island Dam (mainly at the base of Chief Joseph Dam) harvest an average of 800 adults each year (1987-92 data from Chapman and al. 1994). The 1982-89 brood year average ocean fisheries exploitation rate is 39 %, with a total exploitation rate of 68 % estimated for the same years (Myers et al. 1998).

Estimation of recent, past harvest rates for summer chinook originating in the region is complicated by changes in timing of the adult return of the Wells Hatchery group. As a consequence, Chapman et al. (1994) used only one brood year (1977) as the base for estimating preterminal exploitation rates for all subsequent brood years. The recent past (1975-87) mean exploitation rate for Wells Hatchery-origin summer chinook was estimated by Chapman et al (1994) to be about 40 %.

Turtle Rock Fingerling Summer CK Fisheries Contributions												
			Proportion (%) of Total Catch									
Brood Year	Program Release #	# of Fish Program Contributed to Fisheries	AK and Can. Commercial	OR, WA, WA treaty Troll	Col. R. Gillnet	NMFS Ground-Fish	AK and Can. Ocean Sport	WA Ocean Sport*	OR Ocean Sport	Fresh-water Sport**	Treaty C&S	Misc. Fishery Contribution (<1%)
1995	1,243,600	523	60.8	3.2	14.3	0.0	19.5	0.0	0.0	2.2	0.0	0.0
1996	862,515	202	62.3	3.5	6.9	2.9	11.3	3.9	0.0	9.2	0.0	0.0
1997	1,029,540	15	70.5	29.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	609,348	118	51.8	19.0	3.2	0.0	9.6	0.0	15.0	0.0	1.4	0.0
1999	716,972	1,484	61.1	11.8	10.5	0.0	6.7	2.0	0.0	6.8	0.0	1.1
Average	**892,395**	**468**	**61.3**	**13.4**	**7.0**	**0.6**	**9.4**	**1.2**	**3.0**	**3.6**	**0.3**	**0.2**
*** Contains WA Buoy 10 fisheries. ** Combined WA and OR Columbia River and Col. R. Tributaries.**												

Source: WDFW and RMIS

Turtle Rock Yearling Summer CK Fisheries Contributions												
			Proportion (%) of Total Catch									
Brood Year	Program Release #	# Of Fish Program Contributed to Fisheries	AK and Can. Commercial	OR, WA, WA treaty Troll	Col. R. Gillnet	NMFS Ground-Fish	AK and Can. Ocean Sport	WA Ocean Sport*	OR Ocean Sport	Fresh-water Sport**	Treaty C&S	Misc. Fishery Contribution (<1%)
1995	150,000	600	52.3	5.0	12.7	0.0	13.2	5.7	1.2	8.8	1.1	0.0
1996	202,797	798	73.7	5.5	2.2	1.0	13.6	0.0	0.0	3.5	0.0	0.6
1997	202,989	3,222	66.5	9.4	3.7	0.0	9.9	1.8	0.0	5.8	0.0	3.0
1998	167,382	16,770	64.8	9.2	4.4	0.0	13.2	3.0	0.0	3.9	0.0	1.6
1999	192,426	1,217	55.6	18.4	10.4	0.0	9.6	2.5	0.0	2.2	0.0	1.4
Average	**183,119**	**4,521**	**62.6**	**9.5**	**6.7**	**0.2**	**11.9**	**2.6**	**0.2**	**4.8**	**0.2**	**1.3**
*** Contains WA Buoy 10 fisheries. ** Combined WA and OR Columbia River and Col. R. Tributaries.**												

Source: WDFW and RMIS

3.4 Relationship to habitat protection and recovery strategies.

Summer chinook salmon in the mid-Columbia Region are among the most electrophoretically homogenous populations in the state (BAMP 1998). The diversity of habitat they use however, is quite high. One goal of the summer chinook hatchery programs is to develop local adaptation to streams in the Mid-Columbia Region. Production methods are implemented that encourage local adaptation to the various habitats within the region while minimizing negative effects on natural fish populations. One goal of the Mid-Columbia Habitat Program is to protect and restore critical habitats for salmon and steelhead within the Mid-Columbia Region (Bugert et al. 1997). The Mid-Columbia Hatchery Program (BAMP 1998) on which the summer chinook release programs are based will therefore work in concert with that program. The main fresh-water habitat problem presently facing this ESU is presence of hydropower dams in the mainstem Columbia River, which have probably reduced returns of chinook salmon (Chapman et al. 1994). Measures taken by the Mid-Columbia PUDs to improve natural production of anadromous fish in the region will compensate for mortality in project and reservoir passage. Two strategies will be used: (1) habitat protection and restoration, and (2) hatchery production of affected species in the mainstem mid-Columbia River and in the four major tributaries (BAMP 1998).

Habitat protection efforts, combined with production from the summer chinook hatchery programs,

are expected to benefit natural summer chinook production over the short-term and long- term. Improvements in dam passage survival rates, and improvements in smolt to adult survival rates afforded by the summer chinook programs will be used to boost the upper river adult population to a level approaching 18,000 fish at Priest Rapids Dam and approaching 8,000 at Rocky Reach Dam (BAMP 1998).

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 "sub-basin plans") will be developed for the following "sub-basins" (commonly known as watersheds): Wenatchee, Entiat, Lake Chelan, Methow, Okanogan, and the mainstem Columbia River from Rock Island dam to the Canadian border. Sub-basin plans will be submitted to the Northwest Power Planning Council in May 2004. These sub-basin 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.

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3.5 Ecological interactions.

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

(1) negatively impact program;
Summer 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 summer 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 summer chinook productivity.

(4) be positively impacted by program.
Summer 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.

Rocky Reach FH: Often referred to as the "Annex," Rocky Reach FH is located on the east bank of the Rocky Reach tailrace. This facility is funded by Chelan PUD, and has an incubation building (which contains 44 vertical incubator stacks where fall/winter temperatures often reach 17.7^0 C which precluded the use of this system for egg/fry rearing) and eight 1,600 ft vinyl raceways. Water supply for the Annex is 6.2 cfs of water seeping around the grout wall at Rocky Reach Dam. This facility works in conjunction with the Eastbank Hatchery and Turtle Rock Satellite, where the fish undergo final rearing and release. Water supply is 44 cfs of pumped river water to four segments of the channel (11 cfs per channel). Late summer temperatures often reach 20° C, which precludes rearing of yearlings at this site. The 200,000 yearlings (20,000 lbs at 10 fpp) are reared in the eight raceways at Rocky Reach on seepage, then transferred in fall when water temperatures are tolerable (usually in October at 25 fpp), and released from Turtle Rock in April.

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 mainstem Columbia River, Eastbank Hatchery does not use any surface water, so no intake structures are associated with these operations, and no intake screening that may lead to listed juvenile fish injury through entrainment exists. Juvenile fish screening for the water intake systems at Turtle Rock, Wells Hatchery and Priest Rapids Hatchery are not in compliance with NMFS screening criteria (NMFS 1996). The facilities were built prior to the establishment of NMFS criteria. Douglas PUD is committed to be in compliance by November 2005 (Shane Bickford, pers. com., October 1, 2003). Routine intake screen inspections and upgrading to current screening criteria when existing screens fail are conditions which will be included in permit 1347. Without these conditions, water intakes for the hatchery may adversely affect listed spring chinook and steelhead juveniles through entrainment. Application of the conditions to the operation of these hatcheries through this Opinion will help ensure that the effects of the hatchery intakes on listed fish are adequately minimized.

WDFW proposes to operate and monitor their programs in compliance with applicable NPDES permit effluent discharge limitations. Each permit contains limits concerning discharge, monitoring and reporting requirements, and other provisions to ensure that the discharge does not hurt water quality or people's health. In essence, the permit translates general requirements of the Clean Water Act into specific provisions tailored to the specific hatchery facility operations and the discharge of pollutants. Although the actual level of impact of hatchery effluent discharge on listed fish survival is unknown, it is presumed to be small and localized at outfall areas, as effluent is diluted downstream. Turtle Rock facility operates under the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit which conducts effluent monitoring and

reporting and operates within the limitations established in its permit administered by the Washington Department of Ecology (DOE). WAG 13-5004. Monthly and annual reports on water quality sampling, use of chemicals at this facility, compliance records are available from DOE.

Discharges from the cleaning treatment system are monitored as follows: *Total Suspended Solids (TSS)*C1 to 2 times per month on composite effluent, maximum effluent and influent samples. *Settleable Solids (SS)*C1 to 2 times per week on effluent and influent samples. *In-hatchery Water Temperature* - daily maximum and minimum readings.

All facilities in the proposed Mid-Columbia Hatchery Program discharge hatchery effluent directly into the Columbia River or its tributaries. The existing facilities meet or exceed NPDES requirements, and dilution factors downstream of discharge points will have no affect on habitat quality affecting natural species. Total discharge for the facilities are: Wells FH - 83 cfs; Eastbank FH- 53 cfs; Rocky Reach- 35 cfs; Priest Rapids- 117 cfs. The targeted Columbia River discharge at Priest Rapids Dam during juvenile outmigration is 140 kcfs.

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.

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Section 5. Facilities

5.1 Broodstock collection facilities (or methods).

Fish trapped for this program enter Wells hatchery via a ladder separate from the Wells Dam west side and east side ladder systems. Captured fish can then be sorted by species and numbers either back to the river or to the Lower 15 Channel Pond. After all the adults are collected, they are moved to Upper 15 Channel Pond, where broodstock are held for spawning.

Ponds (number)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
1	Channel Pond- Lower 15 at Wells Hatchery	12,232	139	19	4	1.850
1	Channel Pond- Upper 15 at Wells Hatchery	16,500	200	19	3.9	1.850

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

Not needed.

5.3 Broodstock holding and spawning facilities.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
1	Channel Pond- Lower 15 at Wells Hatchery	12,232	139	19	4	1,850
1	Channel Pond- Upper 15 at Wells Hatchery	16,500	200	19	3.9	1,850

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 stack units with 7 trays per ½ Stack	104	4.5	-	6,000	8,000

The main hatchery, Eastbank, has 104 half-stacks of vertical incubators equipped with a chilled water supply (2 gpm per half-stack with 1 gpm of un-chilled ground water),

5.5 Rearing facilities.

Summer chinook fry are reared to fingerling size at Eastbank and Rocky Reach hatcheries. Fish reared at Rocky Reach are transferred as fingerlings to Turtle Rock for continued rearing and release as either sub-yearling or yearling smolts.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Flow Index	Max. Density Index
4	Standard Raceway- Eastbank	3760	100	10	3.75	900		0.125

	Hatchery/Sub-yearling Component							
1	Super-Raceway- Eastbank Hatchery/Sub-yearling Component	22200	180	20	6.2	3500		0.125
7	Vinyl Raceways-Turtle Rock Annex/Sub-yearling Component	1920	70	8	2.5	300-350		0.125
2	Large Ponds-Turtle Rock Island/Sub-yearling Component	46800				2500		0.125

5.6 Acclimation/release facilities.

Final acclimation and release occurs from the Turtle Rock ponds. See above in section 5.5.

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

Turtle Rock/Rocky Reach Annex Wells Hatchery & Remote Satellites- Periodic significant losses have resulted from BKD outbreaks in some fish lots. In some locations a parasitic infestation (*Ichthyophthirius multifilis*) and fungal infections ,can require treatment.

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.

Summer chinook are not listed.

Potential adverse impacts identified with the physical operation of hatchery facilities include impacts from water withdrawal, release of hatchery effluent and facilities failure (NMFS 1999a). Hatchery effluent may transport pathogens (disease) out of the hatchery and infect natural-origin fish. Aside from the potential impacts on water flow and quality, operational failures due to power/water loss, flooding, freezing, vandalism, predation and disease may result in catastrophic losses to rearing adults and juveniles.

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 fish, all efforts should be made to ensure that the survival of fish held for broodstock at the hatchery facility be maximized. The applicants propose a variety of measures to address risks associated with operational failures, including:

- Protection of fish from vandalism and predation is provided by fencing, locks, and security lights at all hatchery facilities;
- Rapid response in the event of power and water loss or freezing is provided by a combination of staffing and automated alarm paging systems; (Chelan PUD provides 24/7 security of the Turtle Rock/Rocky Reach and Eastbank Hatcheries).
- Equipping hatchery facilities to ensure reliable power to provide water to rearing fish during power outages.

Section 6. Broodstock Origin and Identity

6.1 Source.

Broodstock for the Rocky Reach/Turtle Rock program were initially from Priest Rapids FH, but the source was recently changed to Wells FH volunteers, to prevent mixing of the Upper Columbia summer chinook salmon GDU and the Hanford Reach fall chinook salmon GDU. Since the initial operation of the spawning channel in 1967, broodstock collected for Wells Hatchery has come from fish diverted out of fish ladders while passing Wells Dam or from volunteers that enter the trap at the upper end of the hatchery discharge (Chapman et al. 1994). With the exception of undetected strays from other areas that may have contributed to the Wells broodstock collections, and the potential incorporation in some years (1967-86) of fall-run chinook, all broodstock for the Wells Hatchery program came from local Columbia River summer chinook stock (Chapman et al. 1994). Since founding the Wells summer chinook program from trapped Methow/Okanogan natural fish, there has been a transition to the use of mixed natural and hatchery-origin volunteer broodstocks at Wells Hatchery for the Wells and Rocky Reach mitigation programs.

6.2.1 History.

Broodstock Source	Origin	Year(s) Used	
		Begin	End
Upper Columbia River Summer Chinook	N	1967	1970
Wells Hatchery Summer Chinook (Admixture of Natural and Hatchery)	H/N	1971	Present

Propagation of summer/fall Chinook in the Columbia Cascade Province started with operation of the Wells spawning channel in 1967. Initially, the entire run was propagated. Then in 1987, broodstock collection was terminated after August 28th to avoid including stray fall Chinook from downriver programs. All broodstock came from local Columbia River summer/fall Chinook stock with few exceptions. Broodstock was diverted from ladders at Wells Dam or from volunteers that entered the trap at the hatchery discharge. Only low numbers, about 3%, of non-indigenous stocks have been incorporated into the broodstock over the years. Methow and Okanogan subbasins were the major populations intercepted at Wells Dam and supplied the broodstock for the programs (Brown 1999). Since 1987, early-arriving summer/fall Chinook broodstock for the Rocky Reach/Turtle Rock program and the Similkameen program have also been obtained from the trap at Wells Dam and consequently have a similar history (Brown 1999). Prior to 1987, summer/fall chinook were trapped from the west fish ladder at Wells Dam and were diverted into Wells Hatchery. Trapping took place from mid-July through early November (S. Bickford, pers comm. 2003).

Summer chinook broodstock collected for the hatchery programs are the descendants of stock manipulations during the Grand Coulee Fish Maintenance Program and mainstem dam mitigation (Myers et al. 1998). These activities tended to homogenize extant summer chinook populations, and likely resulted in incorporation of fall-run fish into summer chinook runs under propagation. The percentage of non-indigenous stocks incorporated into the hatchery programs has been low (about 3 % of the over 200 million ocean-type chinook propagated since 1941), and does not appear to have had a significant impact on the genetic integrity of the ESU (Chapman et al. 1994; Myers et al. 1998).

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volunteers that enter the trap at the upper end of the hatchery discharge (Chapman et al. 1994). With the exception of undetected strays from other areas that may have contributed to the Wells broodstock collections, and the potential incorporation in some years (1967-86) of fall-run chinook, all broodstock for the Wells Hatchery program came from local Columbia River summer chinook stock (Chapman et al. 1994). Methow and Okanogan basin origin summer chinook were the major populations intercepted at Wells Dam, and supplying broodstock for the program.

Rocky Reach Hatchery - Summer chinook reared at Rocky Reach, and released as smolts from Turtle Rock, are obtained from broodstock procured at Wells Dam.

6.2.2 Annual size.

Annual escapement of summer chinook salmon to Rock Island Dam averaged 15,640 adults and jacks (1983-92 data from Chapman 1994). Hatchery-origin adults are estimated to have contributed part of the escapement levels to the region, averaging about 6 % of the total escapement for the years 1967-87 (Chapman et al. 1995). An escapement objective to basin tributaries above Wells Dam is 3,500; a level carried forth in the Mid-Columbia Hatchery Plan as a natural escapement goal (BAMP). A baseline adult production objective for the summer chinook salmon population reaching Rocky Reach Dam is 30,293 (BAMP 1998). The current annual program broodstock collection goals for the Eastbank hatchery's Wenatchee and Methow/Okanogan summer chinook supplementation programs are 492 and 556, respectively, equally divided by sex. Future production alternatives specified in the Mid-Columbia Hatchery Plan (BAMP 1998) will necessitate the annual collection of from 2,334 to 2,676 summer chinook (1:1 sex ratio), depending on the fate of the Rocky Reach/Turtle Rock program, to meet overall summer chinook smolt production objectives.

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

Currently, broodstock for the program is provided through collection of summer chinook salmon volunteers to the Wells Hatchery trap. Wild fish make up >30% (greater than thirty percent) of the broodstock for other summer chinook programs (Methow/Okanogan). The intent is to spawn only H x H fish for the Turtle Rock program.

6.2.4 Genetic or ecological differences.

The broodstock chosen displays morphological and life history traits similar to the natural population. Broodstock is collected from the natural summer chinook population returning to the Wenatchee sub-basin. There are no known genotypic, phenotypic, or behavioral differences between the hatchery stocks and natural stocks in the target area.

6.2.5 Reasons for choosing.

The summer Chinook component to Wells Dam represented a mixture of the upper Columbia River summer run stocks. Future plans will be to identify local populations (Methow and Okanogan and Wenatchee populations) while portions that return to Wells Dam can be targets of the mitigation programs including Wells and Turtle Rock releases.

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.

No adult fish are captured at the Turtle Rock facility, and no effects on listed chinook or steelhead are expected from the operation. Summer/fall chinook eggs are transferred from broodstock captured as volunteers to Wells Hatchery for the sub-yearling and yearling programs. The lack of a hatchery return site for chinook released from this facility may lead to straying of fall chinook adults into spawning areas that are important for spring chinook and steelhead. Because of temporal separation between wild spring chinook, steelhead and fall chinook spawning, and the different spawning habitat requirements for the species, it is unlikely that straying of Turtle Rock chinook to steelhead or spring chinook spawning areas will have a significant effect on steelhead or spring chinook spawning activity or success.

Section 7. Broodstock Collection

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

Adults collected at Wells dam.

7.2 Collection or sampling design

Mainstem stock for Wells FH and Rocky Reach FH (Turtle Rock) production:,
A mainstem stock will be maintained Wells and Turtle Rock production yet gene flow from this stock to others will be acceptable. Efforts will be made to manage these populations separately, yet it is acknowledged that straying among all populations will occur. These populations will be given strong protection against strays from outside the mid-Columbia Region, but efforts to eliminate strays from within the mid-Columbia will not be a priority. Separation and management of these populations would follow three guidelines.

a) The primary consideration is to achieve a minimum natural escapement of 2,000 adults and jacks past Wells Dam, with an emphasis on meeting the 3,500 escapement level. This goal, by far, takes precedence. The broodstock protocol (to be reviewed yearly), would provide the required direction on means to set, and meet, the yearly goal. If the run size is low in a given year, the hatchery programs will be reduced or eliminated to increase escapement. The order of elimination in hatchery programs is: (1) Wells sub-yearlings, (2) Wells yearlings, (3) the Carlton and Similkameen programs. The trap operations at the east ladder of Wells Dam may be curtailed if needed, to assist in increasing escapement.

(b)The next consideration is to ensure that those salmon intercepted from upstream migration contribute solely to upstream production. For example, volunteers at Wells Hatchery may be used for Methow and Okanogan production, but using salmon trapped at the east ladder for Wells or Rocky Reach should be discouraged, as this places upstream-bound adults significantly down-river. This principle is consistent with the first one; in low escapement years, a preponderance of volunteers can supplement the Eastbank Hatchery broodstock, allowing increased natural escapement.

(c) Marked stray salmon from programs outside the mid-Columbia would be removed from the hatcher broodstocks, when it appears that the percentage of strays from a given program exceeds 5%. This provisional standard is based upon the NMFS Biological Opinion of system wide hatchery operations in the Columbia River (NMFS 1999), and will be revised when results from ongoing region-wide analyses of genetic introgression from straying provides more definitive direction.

(d) The long-term strategy would be to transfer production from mainstem facilities (particularly Turtle Rock) to acclimation sites on tributaries (or near mainstem spawning habitat). This action would presumably further encourage local adaptation, release to adult survival, and natural productivity.

Wells Volunteer ladder: Fish trapped for this program enter Wells hatchery via a ladder separate from the Wells Dam west side and east side ladder systems Captured fish can then be sorted by species and numbers either back to the river or to the Lower 15 Channel Pond. After all the adults are collected, they are moved to Upper 15 Channel Pond, where broodstock are held for spawning.

7.3 Identity.

Summer chinook adults recruiting to the Wells Hatchery trap are a mixture of natural and hatchery-origin fish, and identified by CWT-adipose clip combinations. Gametes secured from these spawners are only used in the Wells Hatchery and Turtle Rock Hatchery release programs, and smolts are not released in areas above Wells Dam. Broodstock are collected from the run at large. Beginning with the 1993 brood, all summer chinook released from the Wells program have external marks (adipose clip and CWT), enabling recognition of adults upon return as of hatchery or natural origin. All yearling smolts produced by the Rocky Reach program (Turtle Rock) are adipose/CWT marked and 200,000 from each sub-yearling group ("accelerated" and "normal are marked as a survival index group.

7.4 Proposed number to be collected:

7.4.1 Program goal (assuming 1:1 sex ratio for adults): Adults are not collected at this facility. Current protocols for the summer chinook programs allow for the annual collection of 1,210 (Wells FH volunteers), equally divided among sexes that are used for the Wells and Turtle Rock Hatchery Programs.

Year	Adults		
	Females	Males	Jacks
Planned	605	605	-
1994	654	371	-
1995	1101	966	134
1996	642	742	9
1997	631	605	**
1998	648	585	**
1999	500	504	**
2000	591	706	**
2001	562	816	**
2002	570	525	**
2003	570	449	**
2004	497	501	**
2005	-	-	-

** Jacks have been included in male counts.

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

Broodstock are not collected at Turtle Rock. At Wells, in the event excess fish are collected, they will be returned to the Columbia River below Wells Dam.

7.6 Fish transportation and holding methods.

Fish are not collected at Turtle Rock and do not need to be transported. A tanker truck can be used for PUD experiments at Wells while handling adults or juveniles for Wells and Turtle Rock. production.

Equipment Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Tanker Truck**	1300	Y	N	150	Salt	U
Marking Trailer	NA	NA	NA	15	MS 222	U
Fish Pump	NA	NA	NA	5	NA	NA

7.7 Describe fish health maintenance and sanitation procedures applied.

The following procedures and policies cover the adults at Wells Hatchery for the Turtle Rock program. The Columbia River watershed is a single "Fish Health Management Zone" under the "Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State" (NWIFC and WDFW 1998), and transfers of salmon within the same zone are allowed from a fish disease management perspective. Regulated pathogens include bacterial kidney disease (BKD), which occurs routinely at virtually all of the facilities that rear chinook salmon, and the pathogen is ubiquitous in Columbia River basin chinook salmon populations, and infectious hematopoietic necrosis virus (IHNV), which has also been identified in adult chinook salmon returning to hatchery facilities in the UCR basin. North American viral hemorrhagic septicemia virus (VHSV) is also regulated, as is *Myxobolus cerebralis* (the protozoan causing whirling disease) which has not been found in the UCR basin. The proposed artificial propagation program will be operated to comply with these guidelines. In addition, fish health protocols will be followed in accordance with Pacific Northwest Fish Health Protection Committee (PNFHPC 1989) and Integrated Hatchery Operations Team (IHOT 1995) guidelines for all programs.

For all production programs under the Mid-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 (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. 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.

Integrated Hatchery Operations Team (IHOT), Pacific Northwest Fish Health Protection committee (PNFHPC), WDFW's Fish Health Manual November 1966, updated March 30, 1998 or Co-manager

guidelines are followed. Fish health procedures used for disease prevention includes biological sampling of spawners, and (in 1992) prophylactic treatment of spawners with an approved therapeutant. 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).

Therapeutic and Prophylactic Treatments:

- Adult chinook are injected with antibiotics for the control of bacterial diseases.
- At spawning, eggs will be water-hardened in iodophor as a disinfectant.
- Juvenile fish will be administered antibiotics orally for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of parasites on fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration will be used for treatments.

7.8 Disposition of carcasses.

Wells broodstock disposition: Carcasses of summer chinook spawned for the Turtle Rock programs are buried on-site at Eastbank Hatchery or Wells Hatchery or returned to the Columbia River near the tail-race of Wells Dam for nutrient enrichment and productivity enhancement purposes.

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.

WDFW addresses this concern in the Wild Salmonid Policy (WDFW 1997), which states that even with a high level of genetic similarity between hatchery and wild fish, the hatchery component should not comprise more than 10% of the naturally spawning population, except in the case of supplementation programs intended to sustain the stock for reasons other than harvest (e.g., habitat degradation, hydropower dams, unforeseen catastrophic loss).

1. The east ladder (and west ladder) trap(s) will be continuously monitored and operated 3 days per week during the summer chinook migration (June 28 through August 28). The east ladder trap is actively manned during trapping and the west ladder trap is passively operated and checked at least daily, ensuring minimal holding times for fish captured.
2. The Wells Hatchery trap does not incorporate a fish weir to guide fish into the hatchery fish ladder. All fish returning to Wells Hatchery recruit to the trap as volunteers. The trapping program is therefore not a "run of the river" operation, and captures of other species besides summer chinook salmon that were produced at the hatchery are minimal.
3. To minimize migration delays to fish other than the targeted species, the fish sorting flume in the west ladder trap will be staffed at all times while the fishway is barricaded for the purpose of guiding fish into the trap.
4. Attraction flows from the false weir will be maintained to encourage fish to use the sorting flume.
5. The traps will be operated in a manner to reduce retention time in the holding pools above the *Denil* fishways accessing the trap.
6. Fish not required for broodstock will be returned into the fishway as they move through the sorting flumes to continue their upstream migration.

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

Adult summer chinook salmon are to be collected at Wells Dam and hatchery for use as broodstock. The broodstock collection objective is to remove equal numbers of males and females.

Section 8. Mating

8.1 Selection method.

Spawners are collected randomly from the run at large arriving at the trapping locations during the July - August summer chinook salmon migration period. Beginning (late June or early July) and ending (late August) dates set for trapping help ensure that only summer chinook salmon are used in these programs. Adult collection at Wells Dam is managed throughout the season in response to fish counts at Rocky Reach Dam to ensure adequate escapement above Wells Dam. A portion of each day's egg-take is used for on-site production at Wells Hatchery to help ensure that the hatchery broodstock remains genetically similar to, and representative of, the up-river summer chinook populations. 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.

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.

8.3 Fertilization.

Spawning protocols reflect the need to maintain genetic diversity of the separate summer chinook populations. Summer chinook collected from the Wenatchee River and at Wells Dam 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. At Wells Hatchery, gametes from fish with CWTs that volunteer to the hatchery trap are held separately until the origin of the fish is determined.

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.

Current protocols for the summer chinook programs allow for the annual collection of 1,210 (Wells FH volunteers), equally divided among sexes including jacks that are used for the Wells and Turtle Rock Hatchery Programs. Egg take goal combined for both programs is 3,000,000 eggs (FBD 2005-06). 1,331,000 eyed eggs and 256,000 green eggs are transferred to Turtle Rock Hatchery. Mitigation is for 56,200 pounds of total production. Fecundity between different programs is compared in Table 10.

Year	Egg Take	Green-Eyed Survival (%)	Eyed-Ponding Survival (%)	Egg Survival Perfor-mance Std.
1995	4,155,000	92.54	na	98.0
1996	2,580,000	94.18	na	98.0
1997	2,717,014	93.40	na	98.0
1998	2,719,086	91.65	na	98.0
1999	2,111,582	93.70	~99.0	98.0
2000	2,201,000	93.09	~99.0	98.0
2001	2,620,000	93.77	~99.0	98.0
2002	2,850,000	Na	~99.0	98.0
2003	2,850,000	Na	~99.0	98.0
2004	2,485,000	Na	~99.0	98.0
2005	-	-	-	-

Table 10. Fecundity for Summer Chinook in the Upper Columbia (WDFW Database 2005).

Stock	Field	1999	2000	2001	2002	2003	5 YR Avg.
MEOK	Females Spawned	254	210	152	233	237	1086
	Estimated Egg Take	1,246,450	1,038,800	750,000	1,147,500	1,175,000	5,357,750
	Fecundity	4,907	4,947	4,934	4,925	4,958	4,933
Wells	Females Spawned	503	564	525	577	575	2744

	Estimated Egg Take	2,475,000	2,780,000	2,620,000	2,850,000	2,850,000	13,575,000
	Fecundity	4,920	4,929	4,990	4,939	4,957	4,947
Wenat-chee	Females Spawned	247	211	152	204	171	985
	Estimated Egg Take	1,220,050	1,040,000	745,200	972,500	847,500	4,825,250
	Fecundity	4,939	4,929	4,903	4,767	4,956	4,899

9.1.2 Cause for, and disposition of surplus egg takes.

The summer/fall Chinook programs may take up to 10% surplus eggs to ensure program release goals are met. The number of surplus eggs will be based on program performance and the greater need of ensuring adequate escapement to the spawning grounds. WDFW is not authorized to destroy excess gametes or fish. This rule applies to the early-arriving summer/fall Chinook reared at Eastbank Hatchery. The take of surplus eggs will be minimized when program survival levels are determined and stabilized.

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.

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. For Eastbank Hatchery, influent and effluent gas concentrations, including dissolved oxygen concentrations, are measured and within parameters optimal for salmonid egg and juvenile fish survival (Brown 2001). Eastbank Hatchery has 70 half-stacks of vertical incubators equipped with a chilled water supply.

9.1.5 Ponding.

Summer chinook 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.

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.

No listed fish are reared in this program.

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.

Wells survival and incubation for a number of summer chinook programs are similar to sub-yearling stage such as studies on the Wenatchee Methow/Okanogan programs (Table 11).

Table 11. Wenatchee and Methow/Okanogan summer chinook program survival summary by life stage (1989-1993 brood years).

Percent survival by life stage		Brood Year				
		1991	1992	1993	1994	1995
Adult (holding)	Wenatchee	90.7	85.7	95.4	94.5	94.7
	Methow/Okanogan	92.4	95.0	83.7	83.1	89.3
Egg	Wenatchee	86.9	79.7	81.7	83.7	86.0
	Methow/Okanogan	88.2	87.0	83.0	86.6	82.3
Fry	Wenatchee	96.6	97.8	99.6	99.2	96.7
	Methow/Okanogan	97.1	98.0	99.8	98.1	96.5
Rearing	Wenatchee	95.7	97.2	98.1	92.3	71.3
	Methow/Okanogan	98.4	95.5	99.5	70.6	89.0
Overall (fertilization to release)						
	Wenatchee	**80.3**	**75.5**	**79.4**	**79.8**	**64.4**
	Methow/Okanogan	**84.2**	**78.2**	**76.7**	**63.3**	**76.6**

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.

9.2.3 Fish rearing conditions.

Influent and effluent gas concentrations at the hatchery, including dissolved oxygen concentrations, are within parameters optimal for juvenile salmonid production (Brown 1999). 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. Settleable 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 is monitored and recorded daily during fish rearing.

Temperatures during the rearing cycle range from a high of 60 degrees F to a low of 33 degrees F.

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.

9.2.5

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*).

Commercial-grade moist, semi-moist, and dry fish feed is used in the operation, and applied at sizes appropriate for the size of the fish being fed. The daily amount fed is determined by the number of fish in the population and individual fish weight. Feed is therefore applied at a daily rate ranging from 3.0 % of the total population weight per day (fry and small fingerlings) to 1.5 % of the total population weight per day for larger fingerlings. The expected feed conversion efficiency rate is 1.2.

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	0.0010	0.7
400-300 fpp	BioMoist Grower 1.0 mm	12	2.2	0.0011	0.75
300-180 fpp	BioMoist Grower 1.3 mm	4	2.2	0.0015	0.75
180-100 fpp	BioMoist Grower 1.5 mm	1	2.0	0.0090	0.8
100-45 fpp	BioMoist Grower 2.0 mm	1	2.0	0.0191	0.8
45-25 fpp	BioMoist Feed 2.5 mm	1	2.0	0.0171	0.9

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

For all production programs under the Mid-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 (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. 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 health and condition is monitored on-site by fish health professionals at the summer chinook rearing locations ten to fifteen times during the freshwater rearing period. In particular, summer chinook are screened prior to transfer and again at release for the incidence of bacterial kidney disease (BKD) through the ELISA process. Results of ELISA testing of `95 brood summer chinook indicate that the prevalence of BKD in the Wenatchee population was very low. The prevalence of BKD in the `95 brood Carlton Pond population was higher than the Similkameen Pond population. The `95 brood Carlton Program failed to meet the numerical release objective because of a BKD outbreak at Methow Hatchery, from which the smolts were transferred. The results of fish health monitoring for the summer chinook programs are presented each year in WDFW Rock Island Fish Hatchery Complex annual reports.

The general policy of the WDFW, the USFWS, and the Yakama Nation 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)

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

None for this program

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.

Listed fish are not under propagation but all fish are handled, transported, and propagated in accordance with the WDFW Fish Health Manual and Pacific Northwest Fish Health Protection Committee disease prevention and control standards to minimize disease transfer to wild fish.

Monitoring and evaluation measures are proposed to address data gaps that lead to uncertainty in the incubation and rearing protocols. These uncertainties include whether the release of ocean-type chinook salmon into the tributaries, areas of significant natural production, impose deleterious ecological effects upon natural fish are of concern. Natural summer chinook in the region are ocean-type populations, and the release of yearling fish through the hatchery programs, an out-migration strategy that differs from the natural population, is of concern. Whether the increasing incidence of "reservoir-reared" juveniles (Petersen and Murdoch 1998) in the natural population is related to the effects of hatchery practices or simply due to hydroelectric impoundments delaying sub-yearling migrations is presently unknown. Unknowns of this yearling release strategy include: the demographic aspects of returning hatchery adults originating from yearling releases; the potential for genetic changes from the natural population from differing selective processes on yearlings versus sub-yearlings; and, the effects of hatchery yearling releases upon natural juveniles. Carefully developed hatchery operation and evaluation programs, such as those developed for the Rock Island Hatchery Complex (RIHC), will be a component of the Mid-Columbia Hatchery Program (BAMP 1998) to identify the hazard of each hatchery program to the listed species, and the means to quantify this risk.

Section 10. Release

10.1 Proposed fish release levels.

1,078,000 sub-yearlings with one group of up to 450,000 at an accelerated growth and a 200,000 yearling component.

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

Turtle Rock /Columbia River/~RKm 790/Mid-Upper Columbia.

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

	Fingerling Release			Yearling Release		
Release Year	No.	Date (MM/DD)	Avg Size (fpp)	No.	Date (MM/DD)	Avg Size (fpp)
1991				220,400	May 8	9.7
1992				211,000	April 21	10.8
1993	1,522,000	June 30	50	201,000	May 13	9.0
1994	838,000	June 21	45	202,000	April 216.0	6.0
1995	1,494,000	June 22	45.2	290,000	April 20	6.8
1996	1,243,600	June 27-28	31.1	193,300	April 6	8.0
1997	862,515	June 30	41.2	150,000	April 17	7.5
1998	1,029,540	June 26	34.3	134,360	April 22	6.9
1999	609,348	June 18 and June 23	35.2	202,989	April 21	6.1
2000	716,972	July 5	35.0	167,382	April 22	9.8
2001	1,054,194	June 26	34.0	192,426	April 26	8.5
2002	694,643	July 2	28.5	165,935	April 12	6.0
2003	656,399 369,461	July 2 June 25	46.0 25.0	203,279 44,800* 66,565*	April 30 April 12-30 May 1-28	8.4 7.0 7.0
2004	491,480 289,696	June 30 June 29	39.0 22.0	195,851 60,000* 112,660* 43,381	May 12 April 18-30 May 1-29 June 7	11.7 10.0 9.0 9.0
2005						

*PUD survival study releases.

10.4 Actual dates of release and description of release protocols.

See Section 10.3 above or actual dates. For the sub-yearling (fingerling) production component, eggs are incubated from green to eyed egg stage at Wells Hatchery and transferred to the Eastbank Hatchery for final incubation (eyed-fry emergence). For the yearling production component, green eggs are transferred to Eastbank Hatchery for full-term incubation (Green egg-Emergence). Three rearing regimes are used:

- For the sub-yearling production component, about 40% of sub-yearling production (~400,000 fish) are reared at Eastbank Hatchery for accelerated rearing to ~58 fpp, and then transferred in early May to Turtle Rock Island facility for rearing and forced release in early July at ~25 fpp.
- For the remaining portion of the sub-yearling production, emergent fry are transferred and reared in Eastbank rearing units, then transferred as un-fed fry to the Turtle Rock Annex facility, reared to ~80-100 fpp, and then transferred in early May to the Turtle Rock Island facility for rearing and forced release in early July at ~55 fpp.
- For the yearling production, emergent fry are transferred and reared at the Rocky Reach Annex rearing units to ~ 40-50 fpp, and then transferred in late October to the Turtle Rock Island facility for a rearing period (late October-April), and yearling smolts are forced release in mid-April at ~8 fpp.
- PUD survival study releases are staggered from April to June as determined by the HCP hatchery committee.

10.5 Fish transportation procedures, if applicable.

Equipment Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Tanker Truck (Juvenile/Smolt Hauling)	2500	Y	N	35	MS 220 and NaCl	5-1.0% (NaCl)

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

Summer chinook salmon juveniles destined for release from Turtle Rock are transferred to the island ponds in October for seven months of acclimation (April release of yearlings), or in May for two months of acclimation (June-July release of sub-yearlings).

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

All yearling summer chinook produced for the Turtle rock program are marked with an adipose clip/coded wire tag and 200,000 from each of the sub-yearling group receive the adipose clip/coded wire tag combination, to allow for visual identification of hatchery origin fish upon adult return, differentiation of hatchery fish from wild fish and from hatchery fish from the various release locations, and assessment of brood year fishery contribution and survival rates by release site.

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

At time of release, all fish up to 110% of approved program levels will be released. Fish will not be transported to acclimation sites in excess of 110% of approved programmed levels.

10.9 Fish health certification procedures applied pre-release.

All fish are examined for the presence of "reportable pathogens" as defined in the PNFHPC disease control guidelines, within 3 weeks prior to release.

The disease management program will follow 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). A qualified fish health specialist will conduct monitoring assessments. This monitoring will be conducted at least monthly and more often when necessary. These inspections must adhere to the disease prevention and control guidelines established by the Pacific Northwest Fish Health Protection Committee;

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

Screens and stoplogs at outlets of rearing ponds would be lifted, and fish would be released into the Columbia River.

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

Measures have been applied to ensure that artificially propagated summer chinook salmon juveniles that are released are ready to actively migrate to the ocean with minimal delay. To meet this condition, fish must be released at a uniform size and state of smoltification that ensures that the fish will migrate seaward without delay. 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 steelhead to prevent catastrophic mortality. Any emergency releases made by the action agencies shall be reported immediately to the NMFS Salmon Recovery Division. 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 for yearlings while size at time of release (50ffp) will be used for sub-yearling releases.

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 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 propagated summer chinook juveniles shall be externally and internally marked (i.e., CWT and adipose fin clipped) prior to release.

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."

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.

Presently there is no formally funded monitoring and evaluation program for the Rocky Reach/Turtle Rock program (Chelan PUD), and only recent agreement with Douglas PUD to begin monitoring and evaluation of the Wells summer chinook program. WDFW submits annual reports as conditioned by Section 10 Permit # - 1347 covering the period from January 1- December 31 and due to NOAA Fisheries by January 31st of the year following release 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.

Adult return information shall include the most recent annual estimates of the number and proportion of artificially propagated fish on the spawning grounds, and the number and location of artificially propagated adults that were recovered outside the release areas. Adult return information and results from monitoring and evaluation activities outside the hatchery environment should be included in the annual report or a separate report. If a separate report on monitoring and evaluation activities conducted outside the hatchery environment is prepared, it shall be submitted by August 31, of the year following the monitoring and evaluation activities (i.e., surveys conducted in 2003, report due August 31, 2004) to NMFS.

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.

WDFW shall develop annual broodstock collection and spawning protocols for the sockeye salmon and chinook salmon artificial propagation programs. Protocols should be coordinated with the co-managers and HCP Hatchery Committees and must be submitted to NMFS by April 15 of the collection year.

The Permit Holders must report the take of any ESA-listed species not included in this permit or authorized under a separate ESA permit, when it is killed, injured, or collected during the course of enhancement/research activities. Notification should be made as soon as possible, but no later than two days after the unauthorized take. The Permit Holders must then submit a detailed written report of the non-permitted take. Pending review of these circumstances, NMFS may suspend enhancement/research activities.

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

Staffing, and other support logistics for the upper Columbia River summer chinook production programs are provided by WDFW. Funding for the programs is provided by PUD No. 1 of Chelan County for the purpose of mitigation for lost fish production associated with hydroelectric power system development in the region. Staffing and funding are available and committed to allow at least partial implementation of data collection, and monitoring and evaluation, described in this section.

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 # - 1347 covering the period from January 1- December 31 and due to NOAA Fisheries by January 31st of the year following release 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. 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.

Research is directed at determination of supplementation program contribution rates, the ecological and genetic effects of the program on the natural population.

12.2 Cooperating and funding agencies.

Chelan PUD (Funding)
Douglas PUD (Funding)
WDFW
Yakama Tribe
Colville Tribe
NFMS

12.3 Principle investigator or project supervisor and staff.

See also permit 1347 or 1482 (pending) annual reports.

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

Upper Columbia River ESU spring chinook salmon (Oncorhynchus tshawytscha).
Upper Columbia River ESU summer steelhead trout (Oncorhynchus mykiss).
Upper Columbia River ESU Sockeye Salmon
Bull Trout populations (Columbia River Distinct Population Segment)

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

See also permit 1347 or 1482 (pending) annual reports.

12.6 Dates or time periods in which research activity occurs.

See also permit 1347 or 1482 (pending) annual reports.

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

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

See also permit 1347 or 1482 (pending) annual reports.

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).

See also permit 1347 or 1482 (pending) annual reports.

12.10 Alternative methods to achieve project objects.

See also permit 1347 or 1482 (pending) annual reports.

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

See also permit 1347 or 1482 (pending) annual reports.

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.

See also permit 1347 or 1482 (pending) annual reports.

Section 13. Attachments and Citations

13.1 Attachments and Citations

Biological Assessment and Management Plan (BAMP). 1998. Mid-Columbia River hatchery program. National Marine Fisheries Service, U. S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, Confederated Tribes of the Yakama Indian Nation,

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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:_____

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

Steelhead

ESU/Population	Upper Columbia Steelhead
Activity	Wells Hatchery Summer Chinook Program (Turtle Rock Broodstock)
Location of hatchery activity	Wells dam left and right bank ladder traps.
Dates of activity	Early May – mid-November
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)				
Collect for transport (b)				
Capture, handle, and release (c)			30 – 40 [1]	
Capture, handle, tag/mark/tissue sample, and release (d)				
Removal (e.g., broodstock (e)				
Intentional lethal take (f)				
Unintentional lethal take (g)				
Other take (specify) (h)				

[1] Yearly estimation of steelhead encountered during salmon broodstock collection (K. Peterson, WDFW, pers. comm. June 1997).

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 Spring Chinook
Activity	Wells Hatchery Summer Chinook Program (Turtle Rock Broodstock)
Location of hatchery activity	Wells dam left and right bank ladder traps.
Dates of activity	Early May – mid-November
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)				
Collect for transport (b)				
Capture, handle, and release (c)			0[1]	
Capture, handle, tag/mark/tissue sample, and release (d)				
Removal (e.g., broodstock (e)				
Intentional lethal take (f)				
Unintentional lethal take (g)				
Other take (specify) (h)				

[1] Run timing separates the migration of listed upper Columbia spring chinook from summer chinook trapping time from June 28 – August 28. .

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.