HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	Methow River (Wells Stock) Summer Steelhead Program
Species or Hatchery Stock	Upper Columbia River Summer Steelhead (*Onchorynchus mykiss*)
Agency/Operator	Washington Department of Fish and Wildlife
Watershed and Region	Methow Subbasin/Columbia Cascade Province
Date Submitted	
Date Last Updated	August 17, 2005

Section 1: General Program Description

1.1 Name of hatchery or program.

Methow River Summer Steelhead Program

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

Upper Columbia River Summer Steelhead (*Onchorynchus mykiss*)

ESA Status: Endangered

1.3 Responsible organization and individuals.

Name (and title):	Rick Stillwater
	Eastbank Hatchery Complex Manager
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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
Douglas and Grant County PUDs	Funding Sources
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

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

Funding Sources
Public Utility District No. 1 Douglas County; Grant County Public Utility District

Operational Information	**Number**
Full time equivalent staff	3.6
Annual operating cost (dollars)	$456,000.00

The steelhead program is funded by Public Utility District Number 1 of Douglas County and Grant County PUD for the purpose of mitigation for lost fish production associated with hydroelectric power system development in the region. The program is authorized under the Mid-Columbia Mainstem Conservation Plan (Wells Dam HCP) and the Priest Rapids Biological Opinion for Section 7 Consultation for the Interim Operation for Priest Rapids Hydroelectric Project (FERC No. 2114). Costs cannot be broken out for the steelhead portion of the program specifically from the total staff and operating budget at Eastbank Hatchery Complex.

1.5 Location(s) of hatchery and associated facilities.

Broodstock source	Upper Columbia Summer Steelhead (Natural and Wells Hatchery)
Broodstock collection location (stream, RKm, subbasin)	Wells Dam (east and west bank ladders) and Wells Hatchery/RKm 861/Upper Middle Columbia
Adult holding location (stream, RKm, subbasin)	Wells Hatchery/RKm 861/Upper Middle Columbia
Spawning location (stream, RKm, subbasin)	Wells Hatchery/RKm 861/Upper Middle Columbia
Incubation location (facility name, stream, RKm, subbasin)	Wells Hatchery/RKm 861/Upper Middle Columbia
Rearing location (facility name, stream, RKm, subbasin)	Wells Hatchery/RKm 861/Upper Middle Columbia

1.6 Type of program.

Conservation/Recovery/Integrated Harvest.

1.7 Purpose (Goal) of program.

The program goal is to mitigate for steelhead losses associated with inundation attributable to Wells Dam and to mitigate for 7% unavoidable steelhead mortality associated with the operation of Wells Dam (Douglas PUD) and Wanapum and Priest Rapids dams (Grant PUD) and contribute to the rebuilding and recovery of naturally reproducing populations in their native habitats, while maintaining genetic and ecological integrity and supporting harvest.

1.8 Justification for the program.

Construction of Chief Joseph and Grand Coulee dams has resulted in substantial habitat blockages. Habitat problems associated with hydroelectric dams, irrigation diversions, urbanization and livestock grazing are limiting the productivity of naturally-produced steelhead in the region. The over-riding habitat factor responsible for the chronic depression of wild steelhead stocks is the construction of nine mainstem Columbia River hydroelectric dams within and downstream of the region (WDF et al. 1993). Each of the projects causes direct mortality by altering the natural Columbia River fluvial characteristics, leading to steelhead mortality from dam passage, migrational delay, and predation. Given existing conditions, and the likelihood that habitat-related factors adversely affecting steelhead productivity in the basin will not be remedied in the near future, steelhead in this region are at high risk of extinction if no hatchery intervention occurs (MCMCP 1997). These circumstances have led NMFS to conclude in their ESA-listing determination regarding steelhead that the Wells Hatchery broodstock presently used by the Washington Department of Fish and Wildlife (WDFW) for supplementation in the region is essential for recovery of the Upper Columbia River Steelhead ESU.

Upper Columbia River Steelhead were listed as an endangered species on August 18, 1997 although recently, NOAA Fisheries is considering listing the ESU as threatened rather than endangered (NOAA Fisheries Lisitng decisions June 16, 2005). WDFW, the Chelan PUD, and the Douglas PUD have been implementing recovery programs for endangered Upper Columbia River Steelhead in the UCR region since the original listing determination. 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. In its review of the status of west coast steelhead (*Oncorhynchus mykiss*) populations, NOAA Fisheries concluded that the naturally-produced steelhead population in the upper Columbia River region (the Columbia River basin upstream of the Yakima River) is clearly not replacing itself (NMFS 1996). Total abundance of steelhead within the Upper Columbia River Steelhead ESU has been relatively stable or increasing in recent years only because of hatchery supplementation programs (NMFS 1996). Hatchery produced steelhead have strongly dominated spawning escapements, with recent contributions estimated to average 54% in the Wenatchee River and 81% in the Methow and Okanogan rivers. The ESU might not exist today if there were no hatchery production based on indigenous upper Columbia River region steelhead stocks (NMFS 1996). Bartlett (WDFW, pers. comm.) used catch record card data reported from above Wells Dam and run composition past Wells Dam from 1989 through 1999 to calculate a mean wild escapement of 10.9% (range 2.5-19%).

WDFW proposes to enhance the UCR steelhead ESU using artificial propagation techniques that include the collection of broodstock, spawning of adults, incubation of eggs, rearing, acclimation, and release of juvenile steelhead. Smolts that volitionally migrate to a collection raceway downstream of the rearing ponds will be collected and directly scatter planted into the Methow and Okanogan basins. Final rearing and acclimation may occur in the Methow or Okanogan basin for some release groups, in some years, if appropriate sites are identified and available such as the Similkameen Pond on the Similkameen River and Bonaparte Pond in the Okanogan River.

WDFW operates three major hatchery complexes within the mid and upper Columbia River basin that encompass steelhead operations not under a federal nexus - Wells, Eastbank, and Priest Rapids

hatcheries. These complexes are funded by several Public Utility Districts to mitigate for lost wild salmonid production and harvest opportunities resulting from hydroelectric dam placement and operation. Funding levels through the Douglas and Chelan PUDs Habitat Conservation Plans have been adopted to produce smolts in the Wenatchee basin and in the Methow-Okanogan basins in facilities managed by WDFW in the Turtle Rock, Eastbank, Chelan, and Wells complexes. Increases in smolt production from Recent analyses of smolt-to-adult return rates indicate that higher levels of smolt releases than those found in table 1 of NOAAs Biological Opinion Section 7 (Consultation Number 2002/000981) may be necessary to achieve the interim adult steelhead escapement targets as described in Section 4a (Section 10 Direct Take Permit 1395). WDFW will strive to obtain resources necessary to increase smolt releases to meet escapement goals 80% of the time.

WDFW shall manage artificially propagated steelhead returning to the Methow River, and Okanogan River basin tributary spawning areas in a manner consistent with recovery goals to enhance natural-origin populations. To reduce the number of artificially propagated UCR steelhead in the spawning areas in excess of full habitat seeding levels and to increase the proportion of the natural-origin steelhead in the tributary spawning populations, the WDFW may employ two methods. They may remove artificially propagated steelhead at dams or other trapping sites and they may use recreational fisheries to reduce the number of adipose fin-clipped hatchery-reared steelhead that may spawn naturally.

Section 10 (a)(1)(A) Permit For Takes Of Endangered/Threatened Species, Permit # - 1395, Expiration Date: October 2, 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 hereby 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 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, 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)(A) of the Endangered Species Act of 1973 (16 U.S.C. §§ 1531-1543), the National Marine Fisheries Service (NMFS) regulations governing ESA-listed species permits (50 CFR Parts 222-226).

1. **Steelhead artificial propagation enhancement program activities as conditioned by Section 10 Permit # - 1395 include:**
    - The collection of broodstock through trapping operations at: Wells Dam and Wells Hatchery for Methow and Okanogan River basin releases; Dryden and Tumwater Dams for Wenatchee River basin releases;
    - The holding and artificial spawning of collected adults at Wells, and Eastbank Hatcheries;
    - The transfer of steelhead eggs or fry to Winthrop National Fish Hatchery for the U.S.Fish and Wildlife Service steelhead program authorized under permit 1396;
    - The incubation and propagation from the fertilized egg through the fingerling, pre-smolt or smolt life stage at the Wells, Eastbank, and Chelan hatchery facilities;
    - The potential for transfer of juvenile steelhead from the central hatcheries for rearing at facilities in the Wenatchee, Methow, and Okanogan River watersheds;
    - The release of juvenile steelhead into the Wenatchee, Methow, and Okanogan River basins, and into the mainstem Columbia River from the hatcheries and acclimation ponds on those systems; and

- The monitoring and evaluation of the 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.

The permit also authorizes the Permit Holders annual incidental take of listed UCR spring chinook salmon during the same activities.

1.9 List of program "Performance Standards".

The following Performance Standards were adapted from the Artificial Production Review (NWPPC, 1999) and modified to satisfy the needs of this program.

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	Monitor and evaluated supplemented and non supplemented (reference) population run-timing, spawn timing and redd distribution

	timing $_{\text{Naturally produced}}$ Ho: Redd distribution $_{\text{Hatchery}}$ = Redd distribution $_{\text{Naturally produced}}$	
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 ≥ 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 independent populations. Ho: Stray hatchery fish < 10% of spawning escapement of any non-target streams within independent population.	Monitor and evaluate hatchery stray rates and proportional contribution to natural spawning aggregates.
6. Provide release of hatchery fish consistent with programmed size and number.	Ho: Hatchery fish $_{\text{Size}}$ = Programmed $_{\text{Size}}$ Ho: Hatchery fish $_{\text{Number}}$ = + 10% of Programmed $_{\text{Number}}$	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 $_{\text{Supplemented population}}$ > Δ smolts/redd $_{\text{Non-supplemented population.}}$	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. disease supplemented fish $_{\text{Time x}}$ = Conc. disease supplemented fish $_{\text{Time x}}$ Ho: Conc. disease supplemented	Perform diagnostic disease investigations in the hatchery population and natural population, in supplemented and non-supplemented streams

	stream $_{\text{Time x}}$ = Conc. disease non-supplemented stream $_{\text{Time x}}$ Ho: Conc. disease hatchery effluent $_{\text{Time x}}$ = Conc. disease hatchery effluent $_{\text{Time x}}$ Ho: Conc. disease supplemented stream $_{\text{Upstream Time x}}$ = Conc. disease hatchery effluent $_{\text{Time x}}$ = Conc. disease supplemented stream $_{\text{Downstream Time x}}$ Ho: Hatchery disease $_{\text{Year x}}$ = Hatchery disease $_{\text{Year y}}$	
9. Minimize adverse impacts to non-target taxa of concern (NTTOC).	Ho: NTTOC abundance $_{\text{Year x through y}}$ = NTTOC abundance $_{\text{Year y through z}}$ Ho: NTTOC distribution $_{\text{Year x through y}}$ = NTTOC distribution $_{\text{Year y through z}}$ Ho: NTTOC size $_{\text{Year x through y}}$ = NTTOC size $_{\text{Year y through z}}$	

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 yearling smolt-sizes (6.0 fish/lb). WDFW hatchery evaluations staff are currently investigating different marking techniques that will be used in conjunction with, or in place of, the standard adipose fin clip to evaluate upper Columbia River steelhead recovery programs. The results of these investigations will be presented as information becomes available in subsequent brood year annual progress reports.	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-5000.	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. <u>Intake screens</u> – 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	Staffing allows for rapid response for	Hatchery engineering design and

to hatchery facility or operation failure is minimized.	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.	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-managers Fish Health Policy and drug usage mandates from the Federal Food and Drug Administration	Hatchery goal is to prevent the introduction, amplification or spread of fish pathogens that might negatively affect the health of both hatchery and naturally reproducing stocks and to produce healthy smolts that will contribute to the goals of this facility.	Pathologists from WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed
6. The risk of catastrophic fish loss due to hatchery facility or operation failure is minimized.	Staffing allows for rapid response for protection of fish from risk sources (water loss, power loss, etc.). Backup generators to provide an alternative source of power to supply water during power outages. Protocols in place to test standby generator and all alarm systems on a routine basis. Multiple rearing sites or footprints for captive broodstock rearing. Alarm systems installed and operating at each rearing vessel to detect loss of or reduced flow and reduced operating head in rearing vessels. Densities at minimum to reduce risk of loss to disease. Sanitation – all equipment is disinfected between uses on different 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.	Steelhead 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	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

	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.	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).

ESA Section 10 Permit #1395 authorizes WDFW to retain up to 395 adult steelhead for broodstock purposes; however the current Wells stock production objective an estimated 373 fish collected from the Wells Dam east and west ladders for use in both Methow and Okanogan River systems.

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

The Wells Hatchery program smolt release objective is 450,000 smolts (350,000 Wells Dam HCP and 100,000 Priest Rapids BiOp). Of the 450,000 smolt program, 320,000 are expected to be released in the Methow River Basin. (Table 1).

Table 1. Current smolt release objective for the Methow River system.

Age Class	Max. No.	Size (fp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Water-shed	Eco-province
Yearling	320,000	6.0	Late April to Mid May	Upper Methow River	RKm 88	Methow	Columbia Cascade
Yearling		6.0	Late April to Mid May	Chewuch River	RKm 32	Methow	Columbia Cascade
Yearling		6.0	Late April to Mid May	Twisp River	RKm 17.6	Methow	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.

All data below is from WDFW Section 10 Direct Take Application (June 12, 2002) and the ESA Section 7 Consultation by NOAA Fisheries 2002.

Hatcheries have increased total summer steelhead run sizes, and from 1984 through 1999 (Table 3), contributed 90% of lower river returns and 75% of upriver returns (WDFW and ODFW 2000). In the case of the Upper Columbia River Steelhead ESU, hatchery fish have comprised between 71% and 91% of the returns between 1986 and 2001 (Table 3). The steelhead return at Priest Rapids Dam over the 16 year period from 1986 to 2001 has averaged 82.3% hatchery fish. Total run size estimates for steelhead have been estimated at Priest Rapids Dam since 1974. Within the Upper Columbia River Steelhead ESU, hatchery steelhead will continue to be used for recovery efforts, as well as to provide other biological and societal needs.

To determine the appropriate release number of hatchery-origin smolts to assist in achieving the interim escapement objectives (NMFS 2002) for upper Columbia River steelhead, an analysis of subbasin-specific smolt-to-adult return (SAR) data is required. Initial analyses of SAR data have been conducted for the Methow-Okanogan steelhead population (Table 4). Production goals for supplementation are based on meeting minimum escapement goals (Table 2) of naturally spawning steelhead (NMFS 2002).

Table 2. Minimum steelhead escapement needs for tributaries (NMFS 2002) and broodstock requirements for areas above Priest Rapids Dam.

Tributaries	Escapement Requirements
Wenatchee River	2,500
Entiat River	500
Methow River	2,500
Okanogan River *	600 *
Small Tributaries	200
Wells Hatchery Broodstock	650
Total	6,950

Note: Ford et al. (2001) did not identify an abundance goal for the Okanogan due to a lack of sufficient historical information. WDFW will use the BAMP (1998) escapement requirement of 597 as an interim goal until the Technical Review Team has completed its review for this system.

Methow-Okanogan Sub-basins

Based on this analysis the current production level of 450,000 smolts from Wells Hatchery and 100,000 smolts released from the Winthrop NFH (550,000 total above Wells Dam) would be expected to produce no less than 2,482 hatchery adults in 8 of every 10 years, 342 fewer adults than the interim escapement objective (Table 6). Due to the unknown reproduction potential of hatchery origin adults spawning in the natural environment, the relative risk of additional smolt production associated with meeting the interim recovery goal 80% of the time should be discussed with the Hatchery Committees identified in the Habitat Conservation Plan process (Public Utility District No. 1 of Douglas County et al. 2002, Public Utility District No. 1 of Chelan County et al. 2002a, 2002b).

Table 3. Priest Rapids Dam adult steelhead returns and stock composition summary.

	Artificially Propagated		Naturally Produced		
Year	Total	Percent	Number	Percent	Total Run
1986	20,022	90%	2,342	10%	22,364
1987	9,955	71%	4,058	29%	14,013
1988	7,530	74%	2,670	26%	10,200
1989	8,033	75%	2,685	25%	10,718
1990	6,252	80%	1,585	20%	7,837
1991	11,169	80%	2,799	20%	13,968
1992	12,102	88%	1,618	12%	13,720
1993	4,538	84%	890	16%	5,428
1994	5,880	87%	855	13%	6,735
1995	3,377	77%	993	23%	4,370
1996	7,757	90%	843	10%	8,600
1997	8,157	91%	785	9%	8,942
1998	4,919	84%	928	16%	5,847
1999	6,903	83%	1,374	17%	8,277
2000	9,023	79%	2,341	21%	11,364
2001	24,174	81%	5,670	19%	29,844
Average	**9,362**	**82.2%**	**2,027**	**17.8%**	**11,389**

Table 4. Smolt/Adult return of Wells Stock, hatchery-origin upper Columbia River summer steelhead for brood years 1981-1996.

Brood Year	Release Year	Number Smolts	Total Brood Year Return to Wells	1-Salt	2-Salt	% BY Return	Adult Return Past Wells	1-Salt	2-Salt	% Return
1981	1982	379,472	28,615	19,140	9,475	7.54	27,734	18,636	9,098	7.31
1982	1983	494,784	17,236	7,444	9,791	3.48	16,768	7,148	9,620	3.39
1983	1984	466,545	18,421	9,791	8,630	3.95	17,948	9,620	8,328	3.85
1984	1985	413,066	7,556	4,854	2,702	1.83	7,122	4,684	2,438	1.72
1985	1986	452,844	5,517	2,702	2,815	1.22	4,888	2,438	2,450	1.08
1986	1987	564,315	3,220	1,654	1,566	0.57	2,791	1,439	1,352	0.49
1987	1988	826,208	5,727	3,040	2,686	0.69	4,880	2,625	2,255	0.59
1988	1989	623,003	4,201	1,323	2,878	0.67	3,766	1,111	2,655	.060
1989	1990	740,433	8,845	4,696	4,149	1.19	8,136	4,331	3,805	1.10
1990	1991	656,997	5,169	3,067	2,102	0.79	4,509	2,812	1,697	0.69
1991	1992	514,610	2,408	701	1,707	0.47	1,895	566	1,329	0.37
1992	1993	511,295	1,461	919	542	0.29	1,050	716	334	0.21
1993	1994	420,110	2,144	813	1,331	0.51	1,722	500	1,222	0.41
1994	1995	450,395	5,351	2,961	2,390	1.19	4,867	2,720	2,147	1.08
1995	1996	328,100	3,432	2,036	1,396	1.05	3,039	1,829	1,210	0.93
1996	1997	477,900	2,775	1,453	1,322	0.58	2,270	1,260	1,010	0.47
1997	1998	478,327	2,849	2,157			1,649	1,649		
1998	1999	843,385	3,479							
1999	2000									
2000	2001									
2001	2002									
2002	2003									
Median						0.92				0.81
Mean						1.63				1.52

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

Wells steelhead program began in 1968.

1.14 Expected duration of program.

Conservation and recovery actions will continue until productivity, genetic diversity, abundance and spatial distribution are sufficient to delist UCR steelhead and continue to meet the HCP and Priest Rapids BiOp mitigation objectives.

1.15 Watersheds targeted by program.

Methow Subbasin/Columbia Cascade Province

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

WELLS SUMMER STEELHEAD

1.16.1 OVERVIEW

The Wells Hatchery summer steelhead program consists of 450,000 yearling smolts released annually in the Methow River Basin (320,000) and the Okanogan River Basin (130,000). Wells Hatchery also supports the Winthrop National Fish Hatchery (WNFH) steelhead program (125,000 eyed-eggs) and transfers up to 200,000 excess eyed-eggs annually for release at Ringold Hatchery on the Columbia River near Pasco, Washington. The Wells steelhead program is funded by Douglas County and Grant County PUDs as mitigation for the construction and operation of Wells Dam and operation of Wanapum and Priest Rapids dams. The goal of the steelhead program was modified after the stock was listed as endangered in 1997, from harvest augmentation using conventional hatchery techniques to conservation/recovery using supplementation

Broodstock are collected from the east and west fish ladders at Wells Dam between August and November. Current broodstock collections target a 33% natural origin broodstock component to facilitate a greater natural origin gene flow into the hatchery program than what has been historically possible through "run-at-large" broodstock collection. The broodstock are held on well water at approximately 11°C (53°F) throughout spawning (December-March). . The prolonged spawn timing (2000-2003 mean = 13 weeks) requires the hatchery to retard the maturation of eggs with a chilled water system in order to maintain consistent emergence timing between the various egg lots and provide appropriate sized smolts for release. Additionally, the hatchery component typically matures earlier than the natural origin component (likely due to past hatchery broodstock collection and mating protocols). In efforts to delay the spawn timing of hatchery fish so that they are more similar to natural origin fish, the program transfers the gametes from the earliest hatchery spawners out to the upper Columbia River to Ringold FH. It is anticipated that over time, the continued infusion of natural origin gene flow into the hatchery program and continued selection of later spawning hatchery fish for the Wells program will delay the spawn timing of hatchery fish to be more consistent with natural origin fish. Synchronized spawn timing of hatchery and natural origin fish will facilitate HxW crosses in the hatchery and likely greater spawning success of hatchery fish in the natural environment

Wells steelhead are reared according to the parental cross (e.g., H x H; H x W).

Wells steelhead are allowed to volitionally migrate from the earthen rearing ponds, and trucked to release sites in the Methow and Okanogan River Basins for direct release.

Tributary specific acclimation ponds would decrease stress associated with truck transport and allow a greater flexibility for the management of non-migrant steelhead. The Wells facility produces high quality smolts, but a proportion of the annual releases residualize in tributaries utilized by wild steelhead, spring chinook and bull trout. Acclimation ponds may provide year-round holding of non-migrant steelhead, or allow recreational fishing opportunities to occur (e.g., Tucannon River program).

1.16.2 POTENTIAL ALTERNATIVES

ALTERNATIVE 1

Wells Hatchery targeted an increased proportion of wild fish within the 2004 broodstock (30%). The inability to delay the maturation of the hatchery fish collected will result in prolonged spawning and handling of all fish within the broodstock, and an increased dependence on hormone injections for wild fish. Consequently, meeting smolt size and coefficient of variation (CV) guidelines will continue to

depend largely on the functionality of the chilled water system.

Without flexibility in marking requirements, fish health and condition will continue to be compromised, and removing excess hatchery origin adults from spawning grounds will be problematic. Although elastomer tagging provides the best alternative currently available, fluctuations in marking efficiencies, tag retention, and color availability limit the effectiveness of elastomer as an evaluation tool.

The lack of acclimation ponds in the Methow Basin forces Wells Hatchery to trap, pump, and truck the volitional migrant steelhead smolts to various release locations. Consequently, volitional migration only occurs when trucks and personnel are available to transport fish to release locations. This limits any potential benefits of the volitional release strategy by limiting the migration time and stressing the juvenile fish immediately prior to planting. Furthermore, acclimation ponds could be used in a variety of ways to limit the prevalence of residual steelhead in tributary streams. Non-migrant steelhead could be retained in the pond indefinitely or released after emergent spring chinook and steelhead have reached a size that affords greater protection from predation.

ALTERNATIVE 2 (WDFW endorsed)

With the greater number of wild fish in the broodstock, the likelihood that W x W genetic crosses will be made also increases. Progeny of different genetic crosses need to be reared and marked separately to maximize monitoring and evaluation efforts and management flexibility of the returning adults. Modify or construct a steelhead holding pond at Wells Hatchery that has an appropriate water temperature regime for steelhead. Modify or construct additional juvenile rearing facilities that will allow separate rearing of three genetic groups (H x H; H x W; W x W).

The ability to hold adult steelhead in water temperatures that fluctuate seasonally, or could be manipulated to reflect seasonal fluctuations would decrease handling stress on the adults, and reduce the dependence on the chilled water system at the hatchery. A natural spawning regime at the hatchery would decrease or eliminate the use of hormone injections, conserve space used for synchronizing juvenile size prior to ponding, and may provide better control of factors affecting variations in fish size at release.

Construct long-term acclimation ponds (October through May) on the Methow River and tributaries.
Acclimation ponds in the Methow River Basin would result in high quality smolts, low incidence of residualism, and high site fidelity of returning adults. In addition, handling stress prior to release and facility resource limitations that affect planting would be greatly decreased.

1.16.3 POTENTIAL REFORMS AND INVESTMENT

Investigation of the reproductive success of hatchery and wild steelhead would provide empirical evidence to the efficacy of hatchery fish in the recovery of natural spawning populations. Although pedigree study designs as described by Ford (2002) would be preferred, such an approach utilizing summer steelhead would require considerable effort expense, and duration due to the protracted spawn timing variable juvenile life histories as well as the potential for resident O. Mykiss to confound the results. Alternatively, a pedigree study approach in an artificial stream would provide greater control and flexibility in the composition of adults and more immediate results Regardless of the study design, genetic pedigree analysis of spawners and juveniles would provide the only empirical information that could be used to evaluate if hatchery programs are contributing to recovery efforts through hatchery contribution to natural spawning production.

Ford, M. 2002. Monitoring the reproductive success and survival of naturally spawning hatchery and natural spring chinook salmon in the Wenatchee, Tucannon, and Kalama Rivers. Proposal submitted to BPA.

Escapement of steelhead populations in all the tributaries in the upper Columbia ESU is difficult to estimate due to the prolonged run-timing, vast potential spawning area, and difficultly conducting spawning ground surveys. Fish counts at the Columbia River hydroelectric projects have been the only consist source of run size data. However, current counting efforts exclude the time period between November 15 and April 15. Given the need to determine escapement levels, fish counting at the dams should be conducted year round. In addition, studies should be initiated to determine the degree of fallback at each respective dam. Escapement measured at the Columbia River dams may be critical information that would lead to de-listing of the ESU.

COST ESTIMATE Refer to Chelan, Douglas, and Grant PUD for estimate

INVESTMENT OR REFORM 3

Acclimation is generally thought of as a 4-8 week time period in which anadromous fish are held in river water immediately prior to release. Some studies have suggested that survival benefits (e.g. increase in SAR) as a result of acclimation are minimal or nonexistent (Wagner et al. 1963; Evenson and Ewing 1992); however Wenatchee River steelhead river water, for 4-6 weeks emigrate faster and have lower residual rates than fish reared on ground water (Murdoch et al. 2000), thus reducing potential negative interactions with natural origin fish and potentially improving overall survival. Recent PIT tag data also suggests that Wenatchee hatchery origin fish acclimated at Turtle Rock (Columbia River, above the Wenatchee River confluence) may have considerable straying to areas above the Wenatchee Basin (Andrew Murdooch, WDFW, Per comm.) Survival benefits of acclimation to Wells steelhead have not been evaluated; however based on Wenatchee River basin steelhead observations, development/implementation of studies of improved survival and homing fidelity to individual sub-basins within the Methow and Okanogan basins may be warranted.

COST ESTIMATE - Unknown

REFERNCES

Everson, M.D., and R.D. Ewing. 1992. Migration characteristics and hatchery returns of winter steelhead volitionally released from Coles Rivers Hatchery, Oregon. North American Journal of Fisheries Management 12: 736-743.

Murdoch, A., K. Petersen, T. Miller, and M. Tonseth. 2000. Draft annual progress report for Wenatchee summer steelhead, 1999 brood. Washington Department of Fish and Wildlife. Olympia, Washington.

Wagner, H.H., R.L. Wallace, and H.J. Campbell. 1963. The seaward migration and return of hatchery-reared steelhead trout, *Salmo gairdneri* Richardson, in the Alsea River, Oregon. Transactions of the American Fisheries Society 92:202-210.

INVESTMENT OR REFORM 4

An adult holding pond of appropriate water temperature is necessary due to prolonged collection period (August – November) and spawning period (December – March) of Wells steelhead. The temperature

regime of the well water at Wells Hatchery typically fluctuates in a narrow range between 11-13° C (53-55°F) depending on which pumps are utilized. As a result steelhead are held in warm water throughout the winter and spring spawning period. As a result, maturation of the broodstock has advanced to mid-winter and acerbates the already early spawn timing of the hatchery component and reduces the opportunity of HxW crosses for this program.

COST ESTIMATE Defer to Douglas PUD

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: 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 1196 Permit Type: Artificial production of upper Columbia spring chinook. Expired Dec 31, 2007 but was amended on January 20, 2004 and expires January 20, 2014. Activities described in the application for this permit have been authorized under terms and conditions of the Biological Opinion on Artificial Propagation in the Columbia River Basin (NMFS 1999).

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

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

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

Authorizations

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

Habitat Conservation Plans:
In 2002, habitat conservation plans (HCPs) were signed by Douglas and Chelan PUDs, WDFW, USFWS, NOAA Fisheries, and the Colville Confederated Tribes. The overriding goal of the HCPs are to achieve no-net 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 Opinion for Section 7 Consultation for the Interim Operation of Priest Rapids Hydroelectric Project. The Biological Opinion directs Grant PUD to mitigate for UCR steelhead and spring Chinook losses attributable to the operation of Wanapum and Priest Rapids dams.

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

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

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.

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.

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

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

- **Provide the most recent 12 year (e.g. 1988-present) progeny to parent ratios, survival data by life stage, or other 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). The average 2000- 2003 return counted through the Priest Rapids Dam fish ladder was approximately 18,620 fish with 3,049 wild fish.

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). 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.

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

Table 7.[WU1]

	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 subbasins for each independent population of Upper Columbia River spring chinook salmon and preliminary Interim Recovery Abundance and Cautionary levels.

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

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

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

UCR Steelhead:

See Table 7.

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.

Sources for this section are taken from the Section 10 Direct Take Permit (#1395), WDFW Application for Permit # 1395 and ESA Serction 7 Consultation for Permit # 1395, 2002).

Activities approved through the Section 10 Direct Take Permit (#1395) that will lead to the intentional take of the listed population include:

- Removal of adults through trapping operations at Wells Hatchery, the Dryden andTumwater dam traps on the Wenatchee River, and in the Methow and Okanogan rivers for hatchery broodstock and future experiments assessing the reproductive success of wild and hatchery adults;
- Holding and artificial spawning of adults at the Wells and Eastbank hatcheries;

- Incubation and propagation from fertilized eggs through the smolt life stage at the Wells, Eastbank, Chelan, and Turtle Rock hatcheries;
- Propagation from eyed-egg to smolt at Klickitat and Ringold hatcheries;
- Transfer of eyed-eggs from Wells Hatchery to Winthrop National Fish Hatchery (NFH)
- and to Klickitat/Ringold fish hatcheries
- Transfer of smolts for release into the Wenatchee River from the Eastbank and Turtle Rock
- hatcheries;
- Transfer of smolts for release into the Methow and Okanogan river systems from Wells
- Hatchery;
- Transfer of smolts at Ringold Springs Rearing Pond (RSRF) for release into the Columbia
- River;
- Removal from the system of returning adult hatchery-origin fish that are excess to spawning and other recovery needs through use of recreational fisheries and direct removal at fishways.

Broodstock collection and research.
Steelhead collected for the supplementation programs will be removed from the natural environment for artificial spawning at Wells or Eastbank hatcheries. This removal constitutes an intentional take of the listed species, and the fish will not be allowed to spawn naturally. Broodstock collection and spawning activities may also affect the genetic integrity and long term fitness of the naturally spawning steelhead populations through excessive straying of broodstock program progeny, collection of broodstock from the wrong stock, alteration of the donor stock genome through hatchery trait selection, and exacerbation of genetic drift and reduction of genetic diversity through reduction of the effective donor stock population size (MCMCP 1997). Listed steelhead collected at Priest Rapids Dam will be held in a trap, anesthetized, sampled, tagged, revived, and released live upstream. No steelhead mortalities have been observed as a result of the sampling program at Priest Rapids Dam.

Broodstock collection.
Annual broodstock collection activities authorized proposed through ESA Section 10 Permit 1395 will lead to the trapping, handling and spawning of approximately 581 Upper Columbia ESU steelhead of hatchery and wild origin. Of this total, 373 hatchery or wild steelhead will be collected through the Wells Hatchery trapping operations, with the remainder (208) taken as hatchery and wild origin from the Dryden and Tumwater dam trapping sites on the Wenatchee River. Assuming a the thirteen year (1989-2001) average passage of 5,461 steelhead at Wells Dam (J. Moore, WDFW, pers. comm.), and average volunteer arrivals to the hatchery trap of up to 60 steelhead, the proposed broodstock collection program at Wells will affect 6.7% of the total upriver-bound population (J. Moore, WDFW, pers. comm.). Broodstock collection methods may stress or injure captured fish, leading to pre-spawning mortality. Five-year average prespawning survival of steelhead collected through the Wells hatchery program has been 98.3% (IHOT 1995). A prespawning mortality of approximately 1.7% of the annual total number of adults collected at Wells can therefore be expected. Because the Wells program now targets a 33% natural origin component within the broodstock collection, 500 adults over and above the 581 retained for broodstock may be trapped, handled and released during broodstock collection if required to achieved collection for one group or the other (eg.hatchery and natural origin). .

Listed steelhead originating in the Okanogan and Methow rivers may also be taken if broodstock collection operations are shifted from Wells Dam to within basin specific watersheds Broodstock secured in the rivers would lead to a one for one decrease in the total number of steelhead needed from collections at Wells Dam to meet the needs of each supplementation program at Wells. The methods used to collect broodstock, including traps and hook and line fisheries, may affect the movement, spawning activities, or migration timing of natural spawners. It is unlikely that these

activities will significantly increase the potential for adult mortality, but the effectiveness of these fish spawning in the wild may be decreased.

Stock assessment and research.
Stock assessment activities at Priest Rapids Dam are expected to handle between 246 and 1,779 Upper Columbia ESU-origin steelhead each year (1986-2001 range). This range represents 6% to 11% of the steelhead population. Because the sample is collected through operation of the trap in one ladder at the dam 1.5 days per week, most of the returning steelhead are allowed to pass unimpeded, and no additional take of Upper Columbia steelhead is anticipated through this sampling program. In 16 years of operation, WDFW personnel have not experienced any mortalities of adult steelhead collected for this program at Priest Rapids Dam (L. Brown, Art Viola, K. Truscott, WDFW, pers. comms.). Trapping and sampling at Priest Rapids in future years is unlikely to lead to immediate mortality of listed steelhead. Stress, descaling and possible injury to captured fish is possible, which may lead to delayed mortality or decreased potential for successful spawning.

Genetic Introgression.
Various deleterious effects (both environmental and genetic) to wild anadromous fish populations may occur as a result of hatchery supplementation actions. Some potential genetic affects such as loss of fitness, reduction in genetic variability, selection and domestication may occur as a function of hatchery breeding or hatchery / wild interactions in the natural environment. Environmental impacts may be acerbated if the hatchery origin fish are not actively migrating (smolt) near the time of release. An active smolt will likely migrate quickly, thereby minimizing the potential negative impact to juvenile anadromous fish populations.

Studies continue on the Wenatchee and Methow Rivers to assess the extent of hatchery smolt emigration, residualism and precocity, as well as monitoring of productivity, spawning and life history characteristics of hatchery and wild steelhead populations as locally adapted steelhead stocks are being developed through supplementation efforts from Wells, Eastbank and Turtle Rock releases.

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). To preserve the remaining natural populations numerical reduction and selection effects will be implemented and included in the permit and removal of broodstock at traps for the enhancement programs shall be consider the composition of the run-at-large with respect to migration timing, age class, and morphology, collection decisions made to maximize the natural population recovery efforts.

Although upper Columbia River hatchery steelhead are genetically similar to wild fish, there is potential risk in allowing a disproportionally high level of hatchery fish to spawn. 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). Under present circumstances, the proportion of hatchery fish rarely is less than 50% in the upper Columbia River tributaries.

Conversely, if hatchery steelhead are "essential for recovery," the degree of use of hatchery fish must be reassessed to accommodate hatchery strategies. This includes selecting fish to reflect the most appropriate return and spawn timing, the use of acclimation ponds to imprint juvenile steelhead to return as adults to specific sites, and the removal of excess hatchery fish by a combination of methods including recreational harvest and removal at fish passage and collection facilities. The 10% level identified in the *Wild Salmonid Policy* may be useful as a guideline, but can not be given strict

adherence because of mortalities attributed to hydropower facilities in the Columbia River, and in situations of low run sizes caused by poor freshwater and marine survival. Such impacts can put this stock in jeopardy because wild fish cannot replace themselves given the cumulative impacts from hydropower projects.

Juvenile rearing, transfers, and releases.

Factors associated with hatchery supplementation of smolts that may lead to take of the listed population include the potential loss of genetic diversity and fitness in the supplemented population resulting from outbreeding depression, inbreeding depression, genetic drift, or trait selection (Hard et al. 1992; Cuenco et al. 1993; Campton 1995). Ecological effects on natural fish by hatchery steelhead smolts released into the region through the supplementation program may also lead to takes in the tributaries, the Columbia mainstem and in the estuary. These effects can include competition, predation, disease transmission, and behavioral modification. Genetic and Ecological Effects on Natural Populations:

Ecological effects.

a) Predation -

The Species Interaction Work Group (SIWG 1984) reported that there is an unknown level of risk of predation by hatchery steelhead on wild steelhead juveniles where they interact in freshwater migrational areas. Although the risk to wild fish is unknown, the group noted that predation may be greatest when large numbers of hatchery smolts encounter newly emerged fry or fingerlings, or when hatchery fish are large relative to wild fish. Due to their location in the upper portions of the drainages and later time of emergence (late spring through August [MCMCP 1997]), wild steelhead fry are not likely to be vulnerable to predation by hatchery smolts. Smolts from the hatcheries are predominantly planted in mainstem river areas in April and May, which separates them spatially and temporally, to a significant degree, from newly-emerging steelhead fry. Witty et al. (1995) concluded that predation by hatchery production on wild salmonids does not significantly impact naturally-produced fish survival in the Columbia River migration corridor. Predation by residual hatchery steelhead on wild salmonids may impact the health of wild steelhead populations (Pearsons et al. 1994). The rate of steelhead residualism is thought to average 5-10% of the number of fish released (NMFS 1995). Martin et al. (1993) reported a residualism rate of 8.6% for a mid-April release group in the Tucannon River. Piscivorus behavior of steelhead and trout is reported to increase markedly when the fish exceed 250 mm total length, which is a size commonly exceeded by residual steelhead in Columbia River Basin migration corridors (Witty et al. 1995). Although residual steelhead of this size are present in migration corridors, they are not considered to be major predators of juvenile salmonids, as most that are observed are in poor condition and are thought not to survive long enough to become piscivorus (Witty et al. 1995). Practices employed at the WDFW hatcheries to minimize numbers of steelhead that will residualize should reduce the potential for residual hatchery steelhead predation on wild steelhead in the region. Preliminary results from WDFW research on the Lewis River, in the lower Columbia River region, indicate low levels of hatchery steelhead smolt predation on salmonids. In a sample of 153 outmigrating hatchery-origin steelhead smolts captured through seining in the Lewis River between April and June 24, 12 fish (7.8%) were observed to have consumed juvenile salmonids (S. Hawkins, WDFW, pers. comm. July 1997). The juvenile salmonids contained in the steelhead stomachs appeared to be chinook fry. Sampling in this study indicated that no emergent wildproduced steelhead or trout fry (30-33mm fork length) were consumed during the first two months of sampling. The vast majority of Merwin Hatchery steelhead released had likely migrated from the river prior to the emergence of wild steelhead fry in 1997. Large concentrations of hatchery steelhead released into the Upper Columbia tributaries may affect wild juvenile steelhead by stimulating predatory responses from bird and non-salmonid fish predators (Steward and Bjornn 1990). This potential increase in predation on wild fish is most likely to occur at the heads of reservoirs, faces of dams, turbine spillways, or bypass discharge areas.

b) Competition -
SIWG (1984) reported a high risk of ecological resource competition between hatchery steelhead and wild steelhead juveniles where they overlap in freshwater occurrence. Impacts from competition are assumed to be greatest in spawning and nursery areas and at release locations where fish densities are highest. These impacts likely diminish as hatchery smolts disperse, but resource competition may continue to occur at some unknown, but lower, level as smolts move downstream through the migration corridor. Steward and Bjornn (1990), however, concluded that hatchery fish kept in the hatchery for extended periods before release as smolts (e.g. yearling salmon) may have different food and habitat preferences than wild fish, and that hatchery fish will be unlikely to out-compete wild fish. Pearsons et al. (1994) reported that competition experiments in small enclosures within the North Fork Teanaway River suggested that competition between hatchery-reared steelhead and naturally-produced rainbow trout adversely impacted rainbow trout growth. Results from four successive annual experimental releases of 33,000 hatchery steelhead into a tributary of the river, however, showed no impacts to the sizes or densities of sympatric wild trout (Pearsons et al. 1994). Hatchery-produced smolts emigrate seaward soon after liberation, minimizing the potential for competition with wild fish (Steward and Bjornn 1990). Competition between upper Columbia River hatchery-origin salmonids and wild salmonids, including steelhead, in the mainstem corridor was judged not to be a significant factor (Witty et al. 1995). 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.

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

d) Disease transmission -
Interaction between hatchery and wild-origin listed steelhead in the tributaries and mainstem areas may lead to fish pathogen transmission. Pathogen transmission has the potential to occur downstream from release locations, throughout the migration corridor. Although hatchery populations are considered to be reservoirs for disease pathogens because of their elevated exposure to high rearing densities and stress, there is little evidence to suggest that diseases are routinely transmitted from hatchery to wild fish (Steward and Bjornn 1990). Chapman et al. (1994) concluded that disease transmittal is probably not a major factor affecting wild steelhead. Two methods significantly decrease the likelihood for transfer of disease from hatchery salmon to wild steelhead. Hatchery liberations coincident with water budget releases and rapid outmigration of released hatchery smolts limit the duration of interaction with wild fish. Adherence to fish disease control and minimization

policies have been set forth for WDFW hatcheries (see IHOT [1995] Policy 403 - "Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State"),

Residualism.
Steelhead remaining after July 1st are classified as residual although some may emigrate the followingspring. A smolt recapture survey in 2003 on the Twisp River indicated 276 marked steelhead remaining during the summer out of 95,390 fish released during the spring (1.84%). Hook and line sampling on the Twisp River indicated that 15.6% and 84.4% of the residual component observed in the Twisp River were a product of volitional and forced truck releases, respectively. Volitional release strategies will be used to reduce the residualization of hatchery fish. In addition, acclimation sites are currently being researched and may be implemented to enhance. rapid downstream migration of released smolts and reduce interactions of hatchery and natural fish. WDFW will release only juvenile steelhead with demonstrated readiness for seaward migration into the upper tributary areas where feasible. Smolt releases will also be timed with water budget releases from upstream dams to further accelerate rapid downstream movement (WDFW 1997). Investigations of the propensity and the causes of residualism of artificially propagated steelhead will be part of the research, monitoring, and evaluation program developed by the HCP Hatcheries Committees. If monitoring indicates that a hatchery population may have a tendency to residualize at a higher than expected rate, the group alternate management changes will be considered to minimize interaction between hatchery and natural origin components. implemented.

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

Hatchery and natural populations have similar ecological requirements and can potentially be competitors where critical resources are in short supply (LGMSC 1993). A total of about 1.1 million steelhead smolts will be released into the Wenatchee, Methow and Okanogan River basins. The artificial propagation programs will be managed to produce only juvenile steelhead ready for seaward migration. Proposed maximum production for these facilities is the same as when the Columbia basin annual production ceiling was established in 1995 (NMFS 1995; WDFW 1997). The Columbia basin annual production ceiling was based on the information on the effects of hatchery fish on listed fish in the migration corridor and ocean. Reviews of the potential effects of hatchery fish in the migration corridor and ocean are provided by Hard (1994), NMFS (1995) and CBFWA (1996). Currently, the only way to address potential ecological interactions between hatchery and natural fish in the Columbia River basin is through the production ceiling (NMFS 1995), which limits the number of hatchery fish released into the basin. A total of about 72 million anadromous salmonid smolts are released from artificial propagation programs annually. The effects of the 1.1 million steelhead smolts cannot be separated from all other smolt releases, nor can the effects of the entire release be determined at this time. NMFS concludes that the production ceiling protects ESA listed species and finds that based on the best available information of adverse impacts in the migration corridor and ocean that the proposed programs have only minor transitory effects.

Juvenile Monitoring.
Juvenile monitoring will include routine growth and health sampling on about a monthly basis. This activity will likely result in handling stress, but is not expected to alter the long-term survival of the population. Occasional lethal sampling will occur for health monitoring and to collect tissue samples. This type of sampling will be conducted in a manner to maximize the information collected from each individual killed. For example, juveniles killed for organosomatic index health monitoring, and tissue samples can be used for DNA analysis, thus only one sample group would be collected for both activities.

Adult Monitoring.
Adult sampling will be coordinated with spawning activities where fish are humanly killed as part of the spawning process. Morphometric samples, sex, mark, tag data, and biological samples such as scales, kidney, spleen and other tissues may be collected. The sampling of adult steelhead after spawning will not increase the level of take or adverse impacts on the species because the steelhead are already dead.

Juvenile Monitoring After Release.
Monitoring of artificially propagated juvenile steelhead after release will be done using a variety of techniques depending on the investigative objective. Extent and impact of residualizism would be assessed using standard angling and non-lethal sampling techniques and migration rate and tributary productivity would be monitored using juvenile fish traps. The capture and handling process is likely to cause some stress on ESA-listed fish. Typically, fish recovery rapidly from handling procedures. The primary factors that contribute to stress and mortality from handling are excessive doses of anesthetic, differences in water temperature, dissolved oxygen conditions, the amount of time that fish are held out of water, and physical trauma. Stress on salmonids increases rapidly from handling of the water temperature exceeds 18°C (64.4°F) or dissolved oxygen is below saturation. Also, stress can occur if there are more than a few degrees difference in water temperature between the stream/river and the holding tank.

The potential for unexpected injuries or mortalities to ESA-listed fish will be mitigated in a number of ways. Wet hands and keeping fish submerged while measuring will minimize scale and slime removal. Study protocols would include only handling fish during appropriate water temperatures to avoid adding any additional stress and ensuring revival prior to release. The use of sanctuary nets when transferring fish to holding containers will avoid potential injuries. Appropriate anesthetics will be used to calm fish subjected to collection of biological data, captured fish will be allowed to fully recover before being released back into the stream and will be released only in slow water areas. Tagging, such as PIT tagging, of natural origin UCR steelhead juveniles would be used to determine trap efficiency and to assess juvenile seaward migration rate and survival to adult would be determined based on tag detections at dam or recoveries on spawning grounds or in broodstock. The information gained is expected to be very valuable in increasing our understanding to UCR steelhead populations and life strategies. NMFS finds the measures above to minimize the impacts of the proposed activities adequate to protect the UCR steelhead ESU. As discussed above in the effects on UCR spring chinook salmon, the WDFW juvenile fish traps are generally operated to achieve a sample efficiency of four to 20 percent of the total run, depending on the river size and the mortality impact would be expected to be less than two percent on target species. Using the largest of the estimates of UCR basin natural production capacity for UCR steelhead of 276,048 (Ford *et al.* 2001) and assuming trap efficiency of 20 percent and mortality of two percent equals an impact of 1,104 smolts. Converting this to adult equivalents (three percent survival smolt-to-adult, Ford *et al.* 2001) results in a maximum loss of up to 33 adult UCR steelhead. Considering that juvenile fish traps will likely not be operated in all tributary basins and will not all achieve an efficiency of 20 percent (for example the lower Wenatchee River trap has previously achieved only about a two percent

efficiency), the numeric impact will likely be much less. Based on the highest adult capacity estimate of 8,281 (Ford *et al.* 2001), or the interim abundance target of 5,000 (Lohn 2002), the loss of 33 adult steelhead is not likely to substantially impact the ESU as whole. Again, it is likely mortality from juvenile fish trapping would be much less than this estimate.

Adult Monitoring (in the wild).

Monitoring of artificially propagated adult steelhead on the spawning grounds will be conducted by air, foot, or float surveys is expected to result in minimal take of UCR steelhead in the form of harassment and collection of tissues from dead steelhead. Potential research or monitoring activities also includes in-water observation of steelhead (i.e., snorkeling). Direct observation is the least disruptive and simplest method of determining presences/absence of the species and can be used to estimate the relative abundance. During some activities redds may be visually inspected, but no redds would be walked on. Potentially, UCR steelhead could experience take in the form of harassment as defined above. However, most activities would not disrupt or injure UCR steelhead. These primarily observational activities will not result in additional mortality of UCR steelhead because carcasses are already dead. The proposed observation, collection of biological data, and tissue samples from carcasses of ESA-listed fish will benefit the species as a whole because of the information gained through these activities will be used in the future to protect, recover, and manage UCR and other steelhead ESUs.

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).

Expected takes of adult and juvenile UCR steelhead are presented in Table 10 and Table 11 and are authorized through ESA Section 10 Permit 1395. 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. 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.

Table 10. Estimated numerical or proportional non-lethal and lethal take of naturally produced and artificially propagated ESA-listed Upper Columbia River (UCR) steelhead adults.

Permit - Holder	Non-lethal	Lethal	Non-lethal	Lethal	Lethal Total
Proposed Activity	Naturally produced adult		Artificially propagated adult		
Permit 1395 - WDFW, Chelan PUD and Douglas PUD					
Adult Monitoring at Priest Rapids Dam [a]					
Proportional Take	10% of run	1% of sample	10% of run	1% of sample	1% of sample
1978-2002 Average	226	2[a]	1,104	11[a]	13[a]
Radio/Active Tag Study	80[b]	4	320[b]	16	20[b]
Disk Tag Application					
Proportional Take	not applied	not applied	3.8% of run	5% of tagged	5% of tagged
9 Years Triggers Met	0	0	485	24	24[c]
Recreational Harvest	See Table 9 below				
Artificial Propagation		216	500[d]	525[e]	581
Dam Survival Studies				55	55
Research and Monitoring	95	3	230	10	13

[a] *Priest Rapids Dam 1978-2002 average count equals 13,306 steelhead., of which 17 percent were of natural origin (2,262 fish).*

[b] *Assumes 1 percent mortality of steelhead captured, handled, and released when water temperature exceeds optimal maximum of 58°C, which on average is 58 percent of the sampling days. The WDFW has not observed a mortality in the previous 16 years.*

[c] *Total radio/active tag application would not exceed 400 fish, natural and hatchery origin component would depend on run composition, would only occur in years of high returns of both natural and artificially propagated steelhead.*

[d] *Capture, handle, release of non-target adult steelhead during broodstock collection activities.*

[e] *If natural origin steelhead are not available artificially produced steelhead would be collected up to the 581 total limit.*

[f] *If natural origin steelhead are not available artificially produced steelhead could be collected up to the 16 total limit.*

Table 11. Estimated numerical or proportional non-lethal and lethal take of naturally produced and artificially propagated ESA-listed Upper Columbia River (UCR) steelhead juveniles.

Permit - Holder	Non-lethal	Lethal	Non-lethal	Lethal	Lethal Total
Proposed Activity	Naturally produced juvenile		Artificially propagated juvenile		
Permit 1395 - WDFW, Chelan PUD and Douglas PUD					
Adult Monitoring at PRD	0	0	0	0	0
Steelhead Management	0	0	0	0	0
Artificial Propagation	0	0	0	0	0
Research and Monitoring [a]	25%	2%	15%	2%	2%
Permit 1396 - USFWS					
Artificial Propagation	0	0	0	0	0
Permit 1412 - Colville Tribes					
Artificial Propagation	0	0	0	0	0
Research and Monitoring [b]	30%	5%	0	0	5%

[a] *Wenatchee and Methow Basin populations.*

[b] *Omak Creek population.*

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 condiditons (#1395).

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 #1395 and previously expired ESA Section 10 Permit #1094..

Section 3: Relationship of Program to Other Management Objectives

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

The artificial propagation activities of this program are included within Biological Opinion for the operation Of the Priest Rapids Hydroelectric Project and the MCMCP, both include approaches for hatchery production that will contribute to the rebuilding and recovery of naturally spawning stocks throughout the Mid-Columbia region to the point that those stocks can be self-sustaining, supporting harvest, while maintaining genetic and ecologic integrity. This program is a consensus plan by fish co-managers and Mid-Columbia Utility Districts for development, operation, and evaluation of anadromous salmonid hatcheries in the Columbia River upstream of the Yakima River confluence The co-managers include National Marine Fisheries Service (NMFS), U. S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, Yakama Indian Nation, Colville Confederated Tribes.
The hatchery program is part of an application for the 50-year multi-species MCMCP and relicensing agreement for the PUDs. The plan has two objectives: (1) to help recover natural populations throughout the Mid-Columbia Region so that they can be self-sustaining and harvestable, while maintaining their genetic and ecologic integrity; and (2) to compensate for the mortality rate at each of the five PUD-owned mid-Columbia River mainstem dams (Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids).

The program described in this HGMP is consistent with the following 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.

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).

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.
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 Opinion for Section 7 Consultation for the Interim Operation of the Priest Rapids Hydroelectric Project (FERC No. 2114).

National Marine Fisheries Service Section 10(a)(1)(A) Permit for the Takes of Endangered/Threatened Species; Permit No. 1395; expiration date-October 2, 2013.

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

- Upper Columbia River Steelhead Management Plan. Fishery management objectives within the UCRSMP and HGMP are consistent.
- The Upper Columbia Salmon Recovery Board (UCSRB and the Regional Technical Committee (RTT): The UCSRB is a partnership among Chelan, Douglas, and Okanogan counties, the Yakama Nation, and the Confederated Tribes of the Colville Indian Reservation in cooperation with local, state, and federal partners. The mission of the UCSRB is *to restore viable and sustainable populations of salmon, steelhead, and other at-risk species through the collaborative efforts, combined resources, and wise resource management of the Upper Columbia Region.* To better meet its mission, the UCSRB wishes to ensure that actions taken to protect and restore salmonid habitat in the region are based on sound scientific principles.
- Endangered Species Act Draft Implementation Plan for the Federal Columbia River Power System (BPA et al. 2001). Kelt reconditioning studies such as those identified in this HGMP are also identified in the IP.
- Northwest Power Planning Council 2000 Fish and Wildlife Program. The proposed hatchery program is consistent with the Vision, Goals, Objectives, and Strategies of the 2000 Fish and Wildlife Program as well as the Okanogan Subbasin Summary created under the Fish and Wildlife Program.
- National Marine Fisheries Service Biological Opinion for Operation of the Federal Columbia River Power System. The work to be conducted under this HGMP is consistent with several Reasonable and Prudent Alternatives as described in the BiOp for the FCRPS (109, 169, 171).
- Mid-Columbia River Habitat Conservation Plan. The HCP indicates that the preferred strategy for the Okanogan River steelhead program is to develop a local population for broodstock to promote local adaptation. The proposed work intends to accomplish this program reform.

3.3 Relationship to harvest objectives.

The WDFW shall manage artificially propagated steelhead returning to the Methow River, and Okanogan River basin tributary spawning areas in a manner consistent with recovery goals to enhance natural-origin populations. To reduce the number of artificially propagated UCR steelhead in the spawning areas in excess of full habitat seeding levels and to increase the proportion of the natural-origin steelhead in the tributary spawning populations, the WDFW may employ two methods. They may remove artificially propagated steelhead at dams or other trapping sites and they may use recreational fisheries to reduce the number of adipose fin-clipped hatchery-reared steelhead that may spawn naturally if the conditions described below are met:

Tier 1: When the natural-origin UCR steelhead run is predicted to exceed 1,300 fish at Priest Rapids Dam and the total UCR steelhead run is predicted to exceed 9,550 steelhead, then a harvest fishery may be considered as an option to remove excess adipose fin clipped hatchery reared steelhead. For a fishery to be authorized in the tributary areas, the tributary escapements must be predicted to meet the minimum targets listed in Table 13, Tier 1. The mortality impact on natural-origin UCR

steelhead, including catch and release mortality and illegal harvest, must not exceed the limits specified for Tier 1 in each tributary area.

Tier 2: When the natural-origin UCR steelhead run is predicted to exceed 2,500 fish at Priest Rapids Dam, the total UCR steelhead run is predicted to exceed 10,035 steelhead, and the tributary escapements meet the minimum targets listed in Table 13, Tier 2, then the natural-origin UCR steelhead mortality impacts, including catch and release mortality and illegal harvest, must not exceed the limits specified for Tier 2 for each tributary area.

Tier 3: When the natural-origin UCR steelhead run is predicted to exceed 3,500 fish at Priest Rapids Dam, and the total UCR steelhead run is predicted to exceed 20,000 steelhead, and the tributary escapements meet the minimum targets listed in Table 12, Tier 3, then the natural-origin UCR steelhead mortality impacts, including catch and release mortality and illegal harvest, must not exceed the limits specified for Tier 3 in each tributary area.

Table 12. Proportional natural-origin UCR steelhead mortality take limit for recreational harvest fisheries in the Wenatchee River, Methow River, and Okanogan River basin tributary areas by run size. Catch and release mortality is assumed to be five percent.

Tributary Area	Priest Rapids Dam Count	Escapement to Tributary Area	Mortality Impact	
			Proportion	Count
Wenatchee River and Columbia River above Rock Island Dam to below Rocky Reach Dam				
	<837	<599	0%	0
Tier 1	838	600	2%	12
Tier 2	2,146	1,700	4%	68
Tier 3	3,098	2,500	6%	150
Methow River and Columbia River above Wells Dam				
	<803	<499	0%	0
Tier 1	804	500	2%	10
Tier 2	2,224	1,600	4%	68
Tier 3	3,386	2,500	6%	150
Okanogan Basin upstream of the Highway 97 Bridge				
	<175	<119	0%	0
Tier 1	176	120	5%	6
Tier 2	180	120	7%	8
Tier 3	795	600	10%	60

Below Priest Rapids Dam: The WDFW proposes to open a recreational harvest fishery below Priest Rapids Dam (in the vicinity of Ringold Springs Rearing Facility) for hatchery steelhead when the run size above Priest Rapid Dam is sufficient to meet interim abundance targets, which based on current information requires at least 8,300 steelhead at Priest Rapids Dam (WDFW 2002). The area encompasses waters below Priest Rapids Dam in the downstream portion of the Hanford Reach from the Highway 395 bridge at Pasco to the old Hanford town site power line towers, a distance of 32 miles. In the proposed fishery, anglers may retain adipose fin-clipped and/or adipose fin-clipped plus ventral fin-clipped steelhead. All unmarked steelhead must be released. The dates for the proposed fishery vary according to fishing method. Anglers may fish from the bank in addition to floating devices from September 16th through March 31st. From April 1st through June 15th anglers may only fish from the bank at the Ringold Springs site and all floatation devices would be prohibited. Bait would be allowed throughout the fishing period. The starting date for the fishery may be postponed until October 15th if pre-season or in-season evaluation of the steelhead run

indicates that the migration over Priest Rapids Dam is delayed or below levels needed to meet recovery objectives. Additionally, the WDFW proposes to remove hatchery steelhead captured in the Ringold Springs ladder that would be in excess of broodstock and recovery needs. These fish would be transported and released in landlocked ponds and lakes to provide additional harvest opportunities on the excess hatchery steelhead.

Above Priest Rapids Dam: The WDFW propose to manage the number of artificially propagated adult steelhead on the spawning grounds in the Wenatchee, Methow, and Okanogan basins. On an annual basis, the run composition information gathered through sampling conducted at Priest Rapids Dam (described above in Section 2.2.1.1) will be assessed on or shortly after September 15th. The components of the run (naturally produced steelhead, adipose fin-clipped hatchery steelhead, and adipose fin-present hatchery steelhead) will be considered in decided whether or not removal of adipose fin-clipped steelhead is warranted.

If the natural component of the run is predicted to be below 1,300 steelhead, no steelhead fishery would be proposed, regardless of total run size. If the natural component is expected to exceed 1,300 steelhead and the total run size is predicted to exceed 9,550, then the WDFW proposes to open a recreational fishery. The fishery would be open from about October 1st through about March 31st, by emergency rules. Excess adipose fin-clipped steelhead may also be removed at the Wells Dam and Wells Hatchery for placement in local lakes or ponds for recreational angling opportunity. The specific locations and retention limits of recreational harvest opportunity would be determined based on the results of a fishery model designed to estimate the effects of removing adipose fin-clipped steelhead from the population. The model considers the following elements; total steelhead run size, percentage of natural origin steelhead, percentage of adipose present artificially propagated steelhead, the percentage of adipose fin-clipped steelhead, and the effects of hooking mortality. Mark and tag identification at Priest Rapids Dam combined with known artificially propagated juvenile release group information would result in estimates of the number of steelhead returning to each tributary basin. The model would then be run using the calculated run estimates for each tributary basin (Okanogan, Methow, and Wenatchee). If a fishery directed on surplus hatchery produced steelhead is authorized, the gear regulations would allow the use of bait in the mainstem Columbia River above Priest Rapids Dam. Any proposed tributary basin (Methow, Okanogan, and Wenatchee) fisheries would open under “selective gear rules,” which are defined as follows: Only unscented artificial flies or lures with one barbless single hook, bait is prohibited; fish may be released until the daily limit is retained; If any fish has swallowed the hook or is hooked in the gill, eye, or tongue, it should be kept if legal to do so. Regulations requiring the release of adipose-present steelhead would be in place on all waters. Regulations may also limit the retention of steelhead with any external tags that may be associated with the Priest Rapids sampling project or other studies in the basin.

3.4 Relationship to habitat protection and recovery strategies.

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

Six fish and wildlife plans (also known as "subbasin plans") will be developed for the following "subbasins" (commonly known as watersheds): Wenatchee, Entiat, Lake Chelan, Methow,

Okanogan, and the mainstem Columbia River from Rock Island dam to the Canadian border. Subbasin plans will be submitted to the Northwest Power Planning Council in May 2004. These subbasin plans will identify and provide the basis for prioritizing project proposals to be submitted to the Northwest Power Planning Council in future funding cycles and will be used, potentially, for salmon recovery planning in North Central Washington.

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

3.5 Ecological interactions.

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

(1) negatively impact program;
Summer steelhead smolts are released in the spring as 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 steelhead 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 steelhead 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 steelhead 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 steelhead productivity.

(4) be positively impacted by program.
Summer steelhead 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 abundance of adults on the spawning grounds (consistent with available habitat) would

provide additional natural origin smolt production in the Methow Basin, and a resulting increase in retuning natural origin adults. Additional juvenile production would provide a benefit to bull trout through increase forage availability.

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.

Wells Hatchery ground water temperature peak at 14°C by September and October and then cool down to 8.0 - 9.0°C by spring. Elevated water temperatures in the fall and winter require chilled incubation to aid in improved incubation and early rearing and acerbate already early spawn timing of hatchery origin fish.

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.

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

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

Sampling at permitted facilities includes the following parameters:

- FLOW Measured in millions of gallons per day (MGD) discharge.
- SS EFF Average net settleable solids in the hatchery effluent, measured in ml/L.
- TSS COMP Average net total suspended solids, composite sample (6 x/day) of the hatchery effluent, measured in mg/L.
- TSS MAX Maximum daily net total suspended solids, composite sample (6 x/day) of the hatchery effluent, measured in mg/L.

- SS PA — Maximum settleable solids discharge from the pollution abatement pond, measured in ml/L.
- SS % — Removal of settleable solids within the pollution abatement pond from inlet to outlet, measured as a percent. No longer required under permit effective June 1, 2000.
- TSS PA — Maximum total suspended solids effluent grab from the pollution abatement pond discharge, measured in mg/L.
- TSS % — Removal of suspended solids within the pollution abatement pond from inlet to outlet, measured as a percent. No longer required under permit effective June 1, 2000.
- SS DD — Settleable solids discharged during drawdown for fish release. One sample per pond drawdown, measured in ml/L.
- TRC — Total residual chlorine discharge after rearing vessel disinfection and after neutralization with sodium thiosulfate. One sample per disinfection, measured in ug/L.

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

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

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

Section 5. Facilities

5.1 Broodstock collection facilities (or methods).

Ponds (number)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
1	Concrete Adult Holding Pond	4680	78.0	10.0	6.0	2500

Fish collected at Wells Dam east and west ladders are transferred to the holding ponds at Wells Hatchery. Future local broodstock collections would be proposed for the Methow and Okanogan Rivers, however no locations or facilities have been identified yet. The WDFW proposes to develop annual broodstock collection and spawning protocols in coordination with NMFS, and the HCP Hatchery Committees to allow for consideration of annual variation in run sizes, ages, and origins (natural and hatchery).

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

Equip. Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Tanker Truck	1300	Y	N	60 – 120	MS 220 and NaCl	5-1.0% (NaCl)

5.3 Broodstock holding and spawning facilities.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
1	Concrete Adult Holding Pond	4680	78.0	10.0	6.0	2500

5.4 Incubation facilities.

Incubator Type	Units (number)	Flow (gpm)	Volume (cu.ft.)	Loading-Eyeing (eggs/unit)	Loading-Hatching (eggs/unit)
Heath Vertical- 33 Half Stack Units at 7 trays per 1/2 stack	33	3-4		1 female**	6500

** Fecunity of female can range from 1000 to 10,000 eggs per female.

5.5 Rearing facilities.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Flow Index	Max. Density Index
8	Concrete Raceways	2338	89.2	9.8	2.7	500		
1	Earthen-Sand Pond (DP-3)	208000	520	100	4.0	2500		
1	Earthen-Sand Pond (DP-4)	204160	464	110	4.0	2500		

5.6 Acclimation/release facilities.

See Rearing Facilities above

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

5.8 Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

Potential 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 endangered steelhead, all efforts should be made to ensure that the survival of adult steelhead 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;
- 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.

Adults trapped at Wells Dam. The broodstock chosen represents natural populations native or adapted to the watersheds in which hatchery fish will be released.

6.2.1 History.

Broodstock Source	Origin	Year(s) Used	
		Begin	End
Upper Columbia River Summer Steelhead Stock	N	1968	U
Wells Hatchery Stock (Upper Columbia River Summer Steelhead Stock)	H	1981	U

6.2.2 Annual size.

The broodstock collection goal for Methow and the Okanogan River system is 373 fish (452 fish initially but has been adjusted); and in recent years, 5-12% of the steelhead captured at Wells Dam have been of natural-origin fish (WDFW 1997). Recent revisions (BY 04) in the broodstock protocols target a 33% natural origin component within the broodstock. The 11-year (1989-99) average Methow and Okanogan river systems (H. Bartlett, WDFW, pers. comm.) run size and escapement estimates are as presented in Table 13.

Table 13. Upper Columbia Steelhead ESU wild and hatchery-origin steelhead average run size and escapements.

River Basin	Run Size	Escapement	Wild-origin Escapement	Hatchery-origin Escapement
Wenatchee	2,700	2,500	800	1,700
Methow & Okanogan	3,950	3,100	350	2,800
Entiat	unknown	unknown	unknown	unknown
Total	~6,650	~5,600	~1,150	~4,500

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

Steelhead collected and propagated at Wells Hatchery originated from a mix of indigenous upper Columbia Basin stocks intercepted through the GCFMP. The current stock was developed in the early 1960s from naturally spawning populations intercepted at fish passage facilities upstream of Priest Rapids Dam (MCMCP 1997). Natural and hatchery-origin steelhead are presently collected at Wells Dam as they migrate past the dam. Historically, the program implemented broodstock protocols that targeted mixed-origin (hatchery and wild) fish obtained randomly from the run at large, spaced throughout the entire run time period, with retention of broodstock by proportional return time. These broodstock collection strategies provided a 4%-12% natural origin proportion within the broodstock and limited the opportunity to infuse meaningful proportions of natural gene-gene flow into the hatchery component. This issue was particularly evident when inriver and ocean conditions provided

maximum survival conditions, where the hatchery component returned in substantial numbers due to the large number of juveniles released. Beginning with the 2004 Brood Year, the Wells steelhead program began targeting a 33% natural origin broodstock component (consistent with natural spawn escapement). The increase in proportion of natural origin fish in the broodstock provided a 100% HxW parental cross for the 2004 Brood Year, substantially improving the natural origin gene flow in the hatchery component.

The program will target 100% HxW progeny for recovery in the Methow River Basin, consistent with smolt production required to meet adult escapement provided by the historical range of smolt-to-adult survival for the Wells stock and as determined by broodstock origin composition. Sixty-two percent of brood year 2000, 70% of brood year 2001and 100% of the brood year 2004 smolts planted from Wells Hatchery into the Methow River were the progeny of HxW adult crosses accessed through broodstock trapped at Wells. This program may shift to using Methow wild broodstock for future outplants. Steelhead smolts planted into the Okanogan watershed are presently progeny of Wells HxH crosses, but HxW or WxW smolts (Okanogan wild source, if available) may be used in future years. All steelhead released into the Methow and Okanogan River will be given a mark/tag unique to parental origin.

6.2.4 Genetic or ecological differences.

Although upper Columbia River hatchery steelhead are genetically similar to wild fish, there is potential risk in allowing a disproportionally high level of hatchery fish to spawn. 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). Under present circumstances, the proportion of hatchery fish rarely is less than 50% in the upper Columbia River tributaries. Conversely, if hatchery steelhead are "essential for recovery," the degree of use of hatchery fish must be reassessed to accommodate hatchery strategies. This includes selecting fish to reflect the most appropriate return and spawn timing, the use of acclimation ponds to imprint juvenile steelhead to return as adults to specific sites, and the removal of excess hatchery fish by a combination of methods including recreational harvest and removal at fish passage and collection facilities. The 10% level identified in the *Wild Salmonid Policy* may be useful as a guideline, but can not be given strict adherence because of mortalities attributed to hydropower facilities in the Columbia River, and in situations of low run sizes caused by poor freshwater and marine survival. Such impacts can put this stock in jeopardy because wild fish cannot replace themselves given the cumulative impacts from hydropower projects.

6.2.5 Reasons for choosing.

Broodstock is collected from Upper Columbia steelhead population of the Methow and Okanogan subbasins. Through collection of natural origin fish originating in the subbasins above Wells Dam and retaining only known Wells Hatchery fish, the program can minimize the divergence from local survival attributes and genetic diversity associated the steelhead populations above Wells Dam.

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.

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). Under present circumstances, the proportion of hatchery fish rarely is less than 50% in the upper Columbia River tributaries.

The removal of adults from the naturally spawning population has potential adverse impacts. These include numerical reduction of the natural population (mining) and selection effects. Selection is the intentional and unintentional collection of adults for broodstock based on one or more of the life history characteristics such as run timing, age, morphology and sex ratio, that do not fully represent the natural (or target) population. The effects of selection or selection effects can change the characteristics of the natural population as well as cause the hatchery-produced fish to diverge genetically or demographically from the naturally produced population. The proposed supplementation program is designed to preserve and rebuild naturally producing steelhead populations in the UCR Region. Natural steelhead in the UCR ESU are not replacing themselves and extinction appears likely without the proposed program. Risks to the donor natural populations, including numerical reduction and selection effects, are therefore viewed by the permit applicants and NMFS as subordinate to the need to expeditiously implement the supplementation program that will prevent extinction of the ESU (BAMP 1998).

Broodstock collection protocols will include limits on the number of days and hours of trap operation. Specific handling procedures and reporting requirements will also be defined. In general, broodstock collection activities would occur with the following sideboards:

- Broodstock would be collected throughout the duration of the run;
- Traps would be checked and all fish removed at least daily;
- Trapping at Wells Dam would occur no more that 3 days a week, if both east and west ladder traps are utilized they would operate concurrently not to exceed 16 hours per day;
- Up to 395 steelhead would be collected at Wells Dam;
- Up to 123 or 33 percent, whichever is lower, of the broodstock could be natural origin steelhead;
- Hook and line collection of steelhead broodstock would be utilized as a last resort and only if traps were not effective;
- Tributary trapping strategies will bedeveloped/implemented to provide for watershed specific broodstock sources upon positive feasibility assessments and potential risk evaluation of target populations.

Section 7. Broodstock Collection

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

Adults trapped at Wells Dam (East and West ladders).

7.2 Collection or sampling design

Adult collection goal is 373 fish, although ESA Section 10 Permit allows the collection of 395 fish if required to meet program objectives. Adult broodstock collection protocols such as those outlined below (2003-04) are keyed on target numbers at various collection sites operated by WDFW that provide broodstock for Mid-Columbia PUD mitigation program facilities. Adult broodstock collection protocols are developed annually and approved by NMFS and the HCP Hatchery Committees prior to implementation and are considered an interim and dynamic hatchery broodstock collection plan, which may be altered following joint fishery party (JFP) discussions. As such, there may be significant in-season changes in broodstock numbers, locations, or collection times, brought about through continuing co-manager consultation and in-season monitoring of the anadromous fish runs to the Columbia River above Priest Rapids Dam.

Wells Hatchery summer steelhead programs and assumptions:

Methow/Okanogan Program	450,000 yearling smolts (230 adults)
WNFH transfer (Methow R)	125,000 eyed eggs for 100,000 smolts (55 adults)
Ringold transfer (Col. R.)	200,000 eyed HxH eggs for 180,000 smolts (88 adults)
Propagation survival	87% fertilization to eyed egg
	86% eyed egg to yearling release
	75% fertilization to yearling release
Fecundity	5,400 eggs per female
Female to male ratio	1 to 1
Pre-spawn survival	97%

Trapping efforts will selectively retain 395 steelhead at Wells Dam (East and West ladder collection), to attain a 30% wild origin component within the broodstock. Based on an estimated 8,000 steelhead returning to Wells Dam and a 10% wild origin component (approximate 10-year average), 800- wild origin steelhead are expected to return to Wells Dam. A 30% wild origin component within the broodstock (112 fish) would result in approximately 14% extraction of the wild origin component arriving at Wells Dam. Increasing the wild origin component within the broodstock to near 30% will provide opportunities to increase the HxW and WxW parental cross proportion of the BY 2004 production from what has occurred previously under random run-at-large collections. Increasing the number of HxW and WxW parental crosses within the Wells Program is consistent with management objectives described in WDFW's ESA Section 10 Permit 1395 Application and consistent with other upper Columbia River summer steelhead supplementation efforts (Wenatchee Basin). Collection will also be selective for adipose present hatchery origin steelhead (HxW parental crosses), consistent with production objectives. The East and West ladder traps at Wells Dam will be operated concurrently, three days per week, up to 16 hours per day. Trapping on the East ladder will be commensurate with summer chinook broodstocking efforts through 28 August and will continue through 29 October, concurrent with west ladder collections. All steelhead excluded from the broodstock will be directly passed upstream at the trapping site or captured, examined and released upstream from the trap site.

Adult return number/origin, age structure and sex ratio will be assessed in-season (Wells Dam and Priest Rapids Dam), and adjustments to the broodstock collection will be made consistent with the estimated return to Wells Dam, proportion of wild steelhead within the return to Wells Dam and

production objectives. Adjustments to the broodstock collection objective may also occur in conjunction with FERC decisions resulting from the Wells HCP. If the FERC authorizes the Wells HCP prior to complete broodstock collection, and stipulate a reduction in DCPUD steelhead mitigation responsibility, the broodstock collection objective may be reduced accordingly.

BIO-SAMPLING

All (wild and hatchery) steelhead brood fish will be DNA tissue-sampled at both Wells Hatchery. This is a relatively simple sampling activity and we will archive the samples for possible future use when demand and budget may allow DNA sample processing. In addition, we should sample the progeny of the three crosses (HxH, HxW, WxW) to establish DNA baselines for Wells steelhead recovery stocks.

In addition to DNA sampling, all carcasses (including pre-spawn mortalities) will be bio-sampled for sex, fork length, POH length, and disposition (spawned or morts). Pituitaries will be collected from spawned fish and stored for possible future use. Further, otoliths and scales (5 from each side in "key" area) will be collected from all wild (adipose present) brood fish regardless of their collection origin. The otoliths will allow more precise estimations of life history than scales alone, and are superior to scales for determining saltwater ages of mature broodstock.

7.3 Identity.

The program will target 100% HxW progeny for recovery in the Methow River Basin, consistent with smolt production required to meet adult escapement provided by the historical range of smolt-to-adult survival for the Wells stock and as determined by broodstock origin composition. All steelhead released into the Methow and Okanogan River will be given a mark/tag unique to parental origin.

7.4 Proposed number to be collected:

7.4.1 Program goal (assuming 1:1 sex ratio for adults): Approximately 373 adults are needed for the Methow and Okanogan system based on 5,400 eggs fecundity and a production objective of 450,000 yearling smolts.

7.4.2 Broodstock collection levels for the last twelve years (e.g. 1990-2001), or for most recent years available. Totals below are for the entire Wells steelhead program not broken out to a Methow portion only.

Year	Adults		
	Females	**Males**	**Jacks**
1994	339	276	-
1995	307	286	-
1996	298	242	-
1997	270	197	-
1998	231	185	-
1999	212	177	-
2000	191	205	-
2001	218	186	-
2002	206	176	-
2003	170	126	-
2004	190	231	-
2005	199	168	-

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

Broodstock that cannot be used for spawning such as in an extremely green condition, or not needed after spawning goals have been met can be returned to the mainstem Columbia above Wells Dam.

7.6 Fish transportation and holding methods.

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

Adult holding Ponds at Eastbank or Wells Hatchery:

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)

1	Adult Holding Raceway- Wells Hatchery	4680	78.0	10.0	6.0	1000-2500

7.7 Describe fish health maintenance and sanitation procedures applied.

Fish are held on well water in the covered raceway pond until spawning. Formalin treatments to control fungus began in November and continued daily on eggs for one hour at a concentration of 1:7,500 through April. Fish are held in well water with an average temperature of 11.1°C. Columbia River water averaged 5.2°C between January and March 2002 when spawning occurred at the hatchery.

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. The adult holding area is separated from all other hatchery operations. All equipment and personnel use disinfection including chlorine or iodiphor procedures upon entering or exiting the area. Formalin treatments are administered every other day during the adult summer steelhead-holding period. Kidney and spleen samples are collected from all lethally spawned steelhead to detect for Infectious Hematopoietic and Pancreatic viruses. Ovarian fluid is also collected from 60 females for additional viral monitoring. The WDFW Fish Health Specialist, is the final authority on fish health issues at the Wells and Eastbank Hatchery Complexes. However, from a management perspective, viral diagnostic samples should be taken for each mating. One-to-one crosses will yield the greatest safety factor in case of a positive viral "hit". Egg pooling (thus pooled viral sample) presents a higher fish health demographic risk in the event of a positive sample. Some occurrence of IPNV and IHNV in Upper Columbia steelhead at Wells FH can be expected and unpooled viral samples with individual family incubation may reduce the chances of cross-contamination from virus-positive gametes. The spawning plan represents a reasonable compromise between potential genetic or demographic recovery benefits and fish health uncertainty.

7.8 Disposition of carcasses.

Steelhead carcasses will be used for stream nutrient enhancement, buried on-station or at an appropriate landfill after completion of spawning.

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.

Each ESA-listed fish handled out-of-water for the purpose of recording biological information must be anesthetized. Anesthetized fish must be allowed to recover (e.g., in a recovery tank) before being released. Fish that are simply counted must remain in water but do not need to be anesthetized.

ESA-listed fish must be handled with extreme care and kept in water to the maximum extent possible during sampling and processing procedures. Adequate circulation and replenishment of water in holding units is required. When using methods that capture a mix of species, ESA-listed fish must be processed first. The transfer of ESA-listed fish must be conducted using equipment that holds water during transfer.

To the extent possible without imposing increased risk to listed species, Chelan PUD, Douglas PUD, and WDFW shall enumerate and identify marks and tags on all anadromous species encountered at adult and juvenile trapping sites. This information shall be included in either an annual brood program report or a monitoring and evaluation report submitted to NMFS.

In trapping operations directed at the collection of broodstock, the Permit Holders shall apply measures that minimize the risk of harm to listed salmon and steelhead. These measures include, but

are not limited to: limitations on the duration (hourly, daily, weekly) of trapping in mainstem river areas to minimize capture and handling effects on listed fish; limits on trap holding duration of listed fish prior to release; application of procedures to allow safe holding, and careful handling and release of listed fish; and allowance for free passage of listed fish migrating through trapping sites in mainstem and tributary river locations when those sites are not being actively operated.

ESA-listed juvenile fish must not be handled if the water temperature exceeds 21°C (69.8°F) at the capture site. Under these conditions, ESA-listed fish may only be identified and counted.

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

WDFW shall monitor the incidence of, and minimize capture, holding, and handling effects on, listed salmon and steelhead encountered during trapping. WDFW shall carefully handle and immediately release upstream incidentally captured listed UCR spring chinook salmon adults that are not intended for use as broodstock in concurrently operated and previously authorized listed stock recovery programs.

The WDFW shall limit operation of Wells Dam east and west ladder traps to no more than three days per week from July through November. If both traps are operated, they shall be operated concurrently, operating on the same three days each week. When operating, active trapping may occur up to 16 hours per day. The ladder shall be open to passage at night to allow passage for listed steelhead.

WDFW shall monitor the incidence of, and minimize capture, holding, and handling effects on, listed salmon and steelhead encountered during trapping. WDFW shall carefully handle and immediately release upstream incidentally captured listed UCR spring chinook salmon adults that are not intended for use as broodstock in concurrently operated and previously authorized listed stock recovery programs.

All trapping operations will be conducted consistent with broodstock collection protocols developed for each program. These protocols specify numbers and timing of fish collections at each trapping location. All steelhead encountered in hatchery operations will be held for a minimal duration in traps. Wild steelhead that are trapped in excess of removal goals will be released upstream immediately without harm. Delay in migration and stress to steelhead encountered will be minimized through these actions.

The following procedures will be used to minimize potential adverse impacts on salmon and steelhead associated with broodstock collection activities:

- All species will be held for a minimal duration in the traps – less than 24 hours;
- Traps and holding areas will be locked or secured against tampering or vandalism;
- All species including steelhead in excess of broodstock goals will be released upstream immediately without harm;
- Steelhead transfers will be done using water-to-water techniques;
- Hook and line technique will be last collection option employed.

Section 8. Mating

8.1 Selection method.

The Wells program will maximize matings of hatchery to natural origin steelhead. The program will target 100% HxW progeny for recovery in the Methow River Basin, consistent with smolt production required to meet adult escapement provided by the historical range of smolt-to-adult survival for the Wells stock and as determined by broodstock origin composition

While our intent is to prioritize HxW crosses, it is probable we will end up with a number of WxW crosses. The progeny of WxW matings should be reared separately from the HxW or HxH production groups until differential tagging can occur. The WxW juveniles will not be adipose clipped to ensure that for all practical purposes the returning adults appear to be wild in origin. Once tagged, progeny from WxW crosses may be combined with HxW groups and will be released into high quality natural production reaches of either the Methow River basin, as appropriate. Adult survival evaluations of WxW crosses will be based on occurrence in future brood collections, sampling at Wells Dam, and the annual sampling at Priest Rapids Dam.

8.2 Males.

Mating occurs in a 1:1 with an additional male used as back-up to ensure the highest likelihood of fertilization. Jack or precocious steelhead (<20" TL) are generally not seen in the population. In past years experience at Wells FH, females occasionally outnumbered males by as much as two to one. To hedge against a sperm shortage males may be used twice as primary and twice as backup (physically crossed twice, with sperm split for primary and backup each time). Due to smaller number of wild males available for broodstock, the spawning protocol allows the wild males to be used twice if needed as oppose to hatchery males used once. We will keep track of male usage with opercle punches and/or Floy tags in the event an individual male is not used twice in one spawning day and thus returned to the holding pond because of low sperm contribution or due to lack of mates.

8.3 Fertilization.

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

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.

Spawn timing of 2002 brood hatchery origin steelhead was significantly earlier when compared to wild steelhead within the broodstock. Due to the difference in spawn timing, pituitary glands from previously spawned steelhead were emulsified and used as a intramuscular injection to accelerate the maturation of wild fish. These injections were used to facilitate gene crosses between hatchery and wild steelhead crosses. Even with hormonal or pituitary injections and excluding early hatchery spawners, including the earliest wild wild spawners, synchronization in spawning in the hatchery and wild fish will be a challenge over the years.

Section 9. Incubation and Rearing.

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

Totals below include entire Wells egg take and not broken out to the Methow steelhead program only. From the total egg take, Wells Hatchery retains approximately 515k eye-eggs for its programs and transfers another 365k eyed-eggs to other programs. The permit level broodstock goal is based on a fecundity of 5,400. In some years, mean fecundity has averaged 6,232 with 2-salt female fecundity 6,744 as compared with 1-salt female (4,779). See also, annual reports as part of the permit condiditons (#1395), and HGMP Section 9.2.1.

Year	Egg Take	Green-Eyed Survival (%)	Eyed-Ponding Survival (%)
1995	1,806,500	84.3	~99.0
1996	1,526,600	82.3	~99.0
1997	1,090,000	89.9	~99.0
1998	1,719,548	85.8	~99.0
1999	1,392,098	75.7	~99.0
2000	1,148,999	84.6	~99.0
2001	987,634	86.22	~99.0
2002	1,133,000	See HGMP Section 9.2.1.	
2003	1,020,000		
2004	1,001,000		
2005*	1,094,500		

* Data preliminary until Section 10 reports are submitted by WDFW

9.1.2 Cause for, and disposition of surplus egg takes.

Due to broodstock collection plan and goals, surplus eggs are not taken. If surplus eggs do occur in the program, they might be raised either to yearling smolts for on-station release; or W x H cross surplus would be released in the Methow subbasin, and H xH cross surplus would be released into Methow, Okanogan subbasin (Similkameen and other tributaries).

9.1.3 Loading densities applied during incubation.

Each female/mating (WxH and HxH Cross) is individuallly incubated at one female per Heath Techna Incubators (16 tray) vertical stack incubators. Natyral steelhead eggs are expected to average 272/oz. Eggs from individual females (14 -26 oz. ; 3,696 – 7,020 eggs) will be incubated individually in Heath. The flow rate to each incubator is maintained at 2-4 gpm throughout the incubation period. After eggs reach the egg stage, they are incubated at 7,500 eggs per tray.

9.1.4 Incubation conditions.

Individual egg lots are kept separated throughout incubation at Eastbank. Incubation, as with rearing, will occur with pathogen free, sediment free, 52-55 0 F well water. An emergency back up

generator for supplying power to the pumps is provided as well as an alarm to alert hatchery personnel of electrical failure or water flow/elevation changes. Also an oxygen system has been installed for safety precautions through power failures.

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.

9.1.5 Ponding.

Wells Hatchery: Fish will be fed after all are buttoned up (usually 1-3 days post swimup). Fish will rear in troughs until July or when fish reach 100/lb, at which time they will be transferred to outside raceways. Ponding generally occurs after the accumulation of 1,650-1,750 temperature units. Unfed fry are transferred to the ponds from early May through early June. The normal weight for fry initially ponded for brood years 1989-95 was 0.45 grams (1,000 fish per pound). Fry fork length was 36-40 mm (Brown 2001).

9.1.6 Fish health maintenance and monitoring.

Eggs will be examined daily by hatchery personnel. Prophylactic treatment of eggs for the control of fungus is prescribed by fish health specialists, and may include treatment with formalin or other accepted fungicides. Non-viable eggs and sac-fry will be removed by bulb-syringe. Adherence to WDFW, Pacific Northwest Fish Health Protection Committee, and IHOT (1995) fish disease control policies reduces the incidence of diseases in fish produced and released from Cassimer Bar Hatchery.

9.1.7 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

Eggs will be incubated in pathogen free, silt free well water to ensure maximum egg survival and minimize potential loss from disease. In order to minimize the likelihood for adverse genetic and ecological effects as a result of fish mortality, an emergency back up generator for supplying power to the pumps is provided as well as an alarm to alert hatchery personnel of electrical failure or water flow/elevation changes. Also an oxygen system has been installed for safety precautions through power failures.

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 (Table 15).

Table 14. Average and median percent survival of juvenile and adult steelhead held at Wells Hatchery, 1996-2001 (WDFW Wells Hatchery unpublished data).

	Brood Year								
	1996	1997	1998	1999	2000	2001	Average	Median	Range
Fert. to eyed	82.5	89.9	85.8	75.7	84.6	86.2	84.1	85.2	75.7 - 89.9
Eyed to smolt	61.4	78.2	60.8	90.9	87.5	93.6	78.7	82.9	60.8 - 93.6
Fert. to smolt	50.6	70.3	52.1	68.8	74.0	80.7	66.1	69.6	50.6 - 80.7
Pre-spawn	97.6	97.8	96.5	99.0	97.1	96.5	97.4	97.4	96.5 - 99.0
Fecundity	5,410	5,167	6,878	6,103	5,451	5,639	5,775	5,545	5,167 - 6,878
Male:Female	0.77:1	1.18:1	0.55:1	0.80:1	0.76:1	0.89:1	0.83:1	0.79:1	
Age 1:2-salt+	56:44	68:32	47:53	50:50	62:38	59:41	57:43	57:43	
1996-1999 Fertilization to smolt survival based on female sub-samples and volume/weight estimates. 2000-2001 Fertilization to smolt survival based on 100% fecundity samples of females.									

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

The rearing conditions at Wells (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. Eastbank Hatchery: Rearing conditions are designed on loading densities recommended by Piper et al. (1982) of 6 lbs/gpm and 0.75 lb/cubic foot (Brown 1999).

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).

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

Rearing Period	Length (mm)	Weight (fpp)	Condition Factor	Growth Rate
August	75	88.9	1.23	
September	112	25.5	1.25	0.713
October	123	19.9	1.23	0.220
November	141	12.5	1.29	0.372
December	153	10.5	1.20	0.160
January	158	10.0	1.16	0.048
February	163	9.0	1.16	0.100
March	170	7.7	1.19	0.144
April	181	6.4	1.14	0.169

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

Same as above.

9.2.6 Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Rearing Period	Food Type	Application Schedule (#feedings/day)	Feeding Rate Range (%B.W./day)	Lbs. Fed Per gpm of Inflow	Food Conversion During Period
Start to 200 fpp	Moore Clark Nutra Plus	6-8	2.5-3.0	0.06	0.5:1.0 to 0.7:1.0
200-75 fpp	Moore Clark Nutra Plus	U	1.75-2.5	0.08	0.8:1.0
75-5.0 fpp	Moore Clark Trout AB	U	0.75-2.0	0.21	0.9:1.0 to 1.2:1.0

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

(WDFW and WWTIT 1998). Fish are monitored daily during rearing for signs of disease, through observations of feeding behavior and monitoring of daily mortality trends. A fish health specialist will monitor fish health as least monthly. More frequent care will be provided as needed if disease is noted. Hatchery Specialists under the direction of the Fish Health Specialist will provide treatment for disease. Sanitation will consist of raceway cleaning as necessary by brushing, and disinfecting equipment.

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

Smolt condition is assessed through visual external examination and assigning a numeric value to each sampled fish based on four different stages of development. Numeric values are designated for fish assessed as smolts = 1, transitional fish = 2, parr = 3, and residual = 4.

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

Camouflage covers over the outside raceways may be used to help maintain a fright response. Demand feeders may also be used where possible to limit human disturbance or habituation to humans.

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.

Fish will be propagated in pathogen free, silt free well water to ensure maximum survival and minimize potential loss from disease. In order to minimize the likelihood for adverse genetic and ecological effects as a result of fish mortality, an emergency back up generator for supplying power to the pumps is provided as well as an alarm to alert hatchery personnel of electrical failure or water flow/elevation changes. Also an oxygen system has been installed for safety precautions through power failures.

Section 10. Release

10.1 Proposed fish release levels.

Up to 320,000 smolts in the Methow System.

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

Twisp River (RKm 17.6), Chewuck River (RKm 32), and the upper Methow River near Mazama (RKm 88). Note: Methow Basin smolt production (Wells Hatchery) is evenly split/distributed to Twisp, Chewuck, and upper Methow release sites.

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

Methow System Plants							
Release Year	Methow River Plants			Chewuck and Twisp River Plants			
	No.	Date (MM/DD)	Avg Size (fpp)	Release Year	No.	Date (MM/DD)	Avg Size (fpp)
1995	226,520	May 18-26	5.8	**1995**	Unk.		
1996	238,500	May 1- 24	5.0	**1996**	Unk.		
1997	310,480	April 25- May 23	6.5	**1997**	Unk.		
1998	127,020	April 29-May 22	5.8	**1998**	126,000 Into the Twisp	April 27- May 22	7.0
				1998	125,300 Into the Chewuch	April 24- May 22	7.0
1999	350,431	April 21-June 8	6.9	**1999**	127,515 Into the Twisp	April 21-June 8	5.1
				1999	96,225 Into the Chewuch	April 21-June 7	5.5
2000	165,900	April 11-May 24	6.8	**2000**	136,681 Into the Twisp	April 25-May 23	6.3
				2000	138,300 Into the Chewuch	April 25-May 23	6.3
2001	116,830	April 27-May 22	7.4	**2001**	109,950 Into the Twisp	May 1- 22	5.9

				2001	99,490 Into the Chewuch	May 1- 22	5.9
2002	94,020	April 29-May 23	6.0	**2002**	84,475 Into the Twisp	April 29-May 23	5.8
				2002	85,615 Into the Chewuch	May 1- 23	6.0
2003	100,035	April 23- May 5	6.1	**2003**	105,323 in the Twisp	May 1- 8	6.0
				2003	117,495 in the Chewuch	April 23- May16	6.2
2004	80,580	April 21- May 6	6.4	**2004**	97,105 Into the Twisp	April 23- May 7	7.3
				2004	78,205 Into the Chewuch	April 21- May 6	7.3
2005	86,041	April 25- May 11	5.4	**2005**	96,420 Into the Twisp	April 25- May 11	5
				2005	82,280 Into the Chewuch	April 25- May 11	5.4

10.4 Actual dates of release and description of release protocols.

See Section 10.3 for dates of release. See Section 10.6 for release protocols.

10.5 Fish transportation procedures, if applicable.

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

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

Smolts volitionally migrate to a collection raceway/chamber downstream of the large rearing ponds; and are pumped from the collection chamber into a tanker truck for transport and direct release into Twisp River (RKm 17.6), Chewuck River (RKm 32), and the upper Methow River near Mazama (RKm 88). Depending on returning adult steelhead distribution objectives, the use of acclimation ponds for

steelhead releases may have merit. For the immediate short term, our objective is to have returning adult steelhead randomly distributed into the upper watersheds where the fish were originally released, fostering widespread spawning distribution into prime natural production reaches. In the meantime, WDFW is considering several acclimation alternatives for Upper Columbia River streams.

Methow River acclimation could be accomplished by utilizing the Twisp and Chewuch acclimation ponds after spring chinook have cleared the area; however, use remains dependent upon complete spring chinook migration from the ponds prior to steelhead release. Smolt releases in 1998, 1999 and 2000 were direct truck releases in the immediate vicinity of the ponds because some spring chinook remained in the acclimation ponds when the steelhead were ready for release. The 2001, 2002, and 2003 smolt releases in the Methow River Basin included direct planting in the Chewuch, Methow and Twisp Rivers. Ten thousand-steelhead were also acclimated at the Methow Salmon Recovery Foundation Pond as a comparison group to the direct-planted Twisp steelhead, and released in the spring of 2003.

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

Hatchery steelhead released from the Wells Hatchery into the Methow River basin are 100% marked/tagged. Current mark/tag strategies include 75% adipose clip rate and 25% VIE tag rate of steelhead released into the Methow Basin. Additionally, a representative proportion will receive CWT or PIT tags.

[WU2]

Hatchery	Release Site	Stock	Purpose	Mark	Approximate 2002 Release
Wells	Methow River	Wells HxW	Recovery/test	VIE/PIT	320,000
	Methow River	Wells HxH	Recovery/control	Ad/VIE/PIT	/1
	Okanogan River	Wells HxH	Recovery	Ad	70,000
	Methow River	Wells HxH	Recovery	Ad	/1
	Similkameen	Wells HxH	Recovery	Ad	60,000
	River	Wells HxH	Mainstem studies	Ad/PIT	- -
	Columbia River	Wells HxH	General release	Ad	- -
	Columbia River				
Winthrop	Methow River	Wells HxH	Recovery	Ad	100,000
Turtle Rock	Wenatchee River	Wenatchee HxH	Recovery/control	VIE/PIT/Ad	50,000
& Eastbank	Wenatchee River	Wenatchee HXW	Recovery test	VIE/PIT	200,000
	Wenatchee River	Wenatchee WxW	Recovery test	VIE/PIT	150,000
Ringold	Columbia River	Wells HxH	General release	Ad/RV	180,000

/1 In the event that HxW plants are significantly under program (i.e. below 320,000 smolts), HxH steelhead will be used in the Methow Basin to achieve the total 320K Methow release target. This location would be best for maintaining stock separation of the returning adults.

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

ESA Section 10 Permit 1395 allows for a 10% overage to the programmed production level. Juvenile production that is within the 10% overage will be released in subbasins above Wells Dam. Disposition of Juvenile production in excess of the 10% overage will be culled from the population in a manner consistent with achieving program goals.

10.9 Fish health certification procedures applied pre-release.

Fish health and disease condition are continuously monitored in compliance with the requirements of the "Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State" (Co-managers 1998), requirements of the Section 10 ESA permit issued and guidelines of IHOT (1995). Steelhead have been monitored daily by staff during rearing for signs of disease, through observations of feeding behavior and monitoring of daily mortality trends. A fish health specialist has been monitoring fish health as least monthly with these inspections must adhere to the disease prevention and control guidelines established by the Pacific Northwest Fish Health Protection Committee; More frequent care will be provided as needed if disease is noted. Prior to release, the Area Fish Health Specialist establishes the population health and condition. This is commonly done 1-3 weeks pre-release and up to 6 weeks on systems with pathogen free water and little or no history of disease.

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

Fish must be released at a uniform size and state of smoltification that ensures that the fish will migrate seaward without delay after release. 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. Fish would be released via exit pipe to Columbia River. This exit system is not well constructed, and could cause mechanical injury to fish release into it. And if time permitted, fish would pumped from ponds into tanker trucks, and transported to the Wenatchee River and directly outplanted.

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

Fish are released at several sites within each watershed to minimize ecological impacts on juvenile wild salmonids that might result from outplanting large numbers of fish at a single location, and to foster widespread distribution of returning adult spawners across available habitat.

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.

To ensure steelhead destined for outplanting are smolted and ready for seaward migration, smolts that are volitionally-released are collected in ponds below the rearing raceways. Collected smolts are then truck-planted at designated release locations. Fish are released at several sites within each watershed to minimize ecological impacts on juvenile wild salmonids that might result from outplanting large numbers of fish at a single location, and to foster widespread distribution of returning adult spawners across available habitat.

Through these practices, smolts will migrate seaward without delay, minimizing interactions with listed wild 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 hatchery steelhead 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.

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."

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

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

Section 11. Monitoring and Evaluation of Performance Indicators

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

A summary report documenting the monitoring and evaluation activities associated with endangered UCR steelhead hatchery supplementation program is included in annual progress reports submitted to NOAA Fisheries. Such monitoring and evaluation efforts shall include the relative success of juvenile rearing procedures and techniques, a description of any substantial mortality events in the hatcheries, CWT recoveries and analysis, an evaluation of relative success of hatchery x natural and natural x natural crosses and an evaluation of release strategies.

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

Natural Environment Monitoring Reporting includes 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.

The hatchery committees will discuss and implement adjustments to production levels of supplementation fish at least every five years, in relation to increases or decreases in wild fish escapement. Decisions concerning annual hatchery production and release of supplementation fish will be made in consideration of future run predictions and ocean condition forecasts. Recommendations by the Hatchery Committees concerning appropriate production levels are

reviewed and incorporated into fish management plans developed by state, tribal and federal fisheries managers under *U.S. v. Oregon*.

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

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

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

See Section 11.1.1

Section 12. Research

12.1 Objective or purpose.

Research is directed at determination of supplementation program contribution rates, and ecological and genetic effects of the program on the natural population. WDFW will consult with NMFS to develop a study of reproductive success assessing hatchery origin adult steelhead using DNA micro-satellite technology. Experimental design, stock, and specific objectives have yet to be determined and must also be approved by the Hatchery Committee. Two approaches will be used to examine reproductive success of both Wenatchee and Wells hatchery steelhead. Due to an extensive upstream migration period and smolts with multiple freshwater age classes, a pedigree approach in the natural system would be logistically difficult. A pedigree approach could be used experimentally using the spawning channel at Wells Dam. Equal proportions of wild, HxH, HxW, and/or WxW adults would be sampled (i.e fin clip) and placed into the spawning channel. Tissue samples would be randomly collected from emergent fry. Due to the artificial habitat limitations of the spawning channel and duration of the studies (fry versus smolt), an alternative approach could be established in the Methow basin using naturally produced smolts. Assuming there is a discernable genetic difference between Wells Hatchery origin stock and wild Methow stock, representative samples of wild smolts could be collected from the lower Methow River using a smolt trap. Collected tissues samples would be analyzed according to parental origin of the juveniles. The proportion wild naturally-produced smolts with hatchery parentage would be compared to the proportion of hatchery adults on the spawning grounds for each respective brood year. For this approach to be successful, it is necessary for a DNA marker to be established for Wells hatchery stock. Analysis of DNA samples collected from previous broodstock would be analyzed before field collections were initiated. Up to 120 adult steelhead (no more than 50% wild) would be collected from Wells Dam for experiments in the Wells Fish Hatchery spawning channel to determine egg-to-parr survival rates. Initially, 1,000 tissues samples would be collected from the progeny of these experiments. Additionally, up to 20,000 progeny (actual number would be determined by estimated survival rates) from proposed experiments would be PIT tagged, DNA sampled and subsequently released into respective river basins. Subsequent individual PIT tag detections could occur at the time of emigration (typically 1-3 years) and upon adult return. Tissue analysis would only be conducted on samples from recaptured fish bearing PIT tags. Using PIT tags would allow estimation of individual and group egg-to-parr, parr-to- smolt, and smolt-to-adult survival rates. Up to 1,000 tissues samples would be collected from naturally-produced juvenile steelhead emigrating from the Methow River. Fish would be anesthetized, tissue and scale samples collected, length and weight recorded. All fish would be released after recovering in fresh water.

The experimental pedigree study is the only applied research activity proposed and has not been fully developed; therefore Sections 12.2 – 12.12 are not applicable at this time. At such time as the applied research activities are developed, they will be submitted to the HCP Hatchery Committees and NMFS for review and approval and will address sections 12.2 – 12.12.

12.2 Cooperating and funding agencies.

Douglas County Public Utility District No. 1 provides the funding for the research/Monitoring-Evaluation Program. Staffing and funding are committed through the Wells Dam HCP Agreement. Additional funding and staff may be necessary to carry out some of the M&E objectives subsequently identified in the MCMCP or as identified and prioritized through continued evaluation work.

12.3 Principle investigator or project supervisor and staff.

NA

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

NA

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

NA

12.6 Dates or time periods in which research activity occurs.

NA

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

NA

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

NA

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).

NA

12.10 Alternative methods to achieve project objects.

NA

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

NA

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.

NA

Section 13. Attachments and Citations

13.1 Attachments and Citations

BPA (Bonneville Power Administration). 1996. A biological assessment of the effects of releasing late winter run steelhead on Snake River threatened and endangered salmon stocks. Report submitted to NMFS by BPA June, 1996. BPA, Portland.

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, Confederated Tribes of the Colville Indian Reservation, Confederated Tribes of the Umatilla Indian Reservation, Chelan County Public Utility District, and Douglas County Public Utility District. Mid-Columbia Mainstem Conservation Plan. 135pp.

Brown, L. 1995. Mid-Columbia River summer steelhead Stock Assessment - a summary of the Priest Rapids steelhead sampling project, 1986-1994 cycles. Washington Department Fish and Wildlife Anadromous Fish Division. Report AF95-02.

Brown, L. 1997. 1997 Salmon/steelhead adult broodstock collections - site based broodstock protocols. Memorandum to Joint Fisheries Parties/Mid-Columbia coordinating Committee. Mid-Columbia Field Office, Washington Department of Fish and Wildlife. Wenatchee, WA. April 16, 1997.

Buettner, E.W., V.L. Nelson. 1987. Smolt condition and timing of arrival at Lower Granite Reservoir - annual report for 1986 operations. Project No. 83-323B. Bonneville Power Administration, Portland, OR. 46 pp.

----------. 1988. Smolt condition and timing of arrival at Lower Granite Reservoir - annual report for 1987 operations. Project No. 83-323B. Bonneville Power Administration, Portland, OR. 71 pp.

----------. 1989. Smolt condition and timing of arrival at Lower Granite Reservoir - annual report for 1988 operations. Project No. 83-323B. Bonneville Power Administration, Portland, OR. 51 pp.

Bugert, R., K. Petersen, G. Mendel, L. Ross, D. Milks, J. Dedloff, and M. Alexandersdottir. 1991. Lower Snake River Compensation Plan, Tucannon spring chinook evaluation program. Report to U.S. Fish and Wildlife Service, Cooperative Agreement 14-16-0001-91534. Washington Dept. Fish and Wildlife, Olympia, WA.

Busack, C.A. and K.P. Currens. 1995 Genetic risks and hazards in hatchery operations: fundamental concepts and issues. Amercian Fisheries Society Symposium 15:71-80.

Campton, D.E. 1995. Genetic effects of hatchery fish on wild populations of Pacific salmon and steelhead: what do we really know? American Fisheries Society Symposium 15:37-353.

Chapman, D., C. Peven, T. Hillman, A.Giorgi, and F.Utter. 1994. Status of summer steelhead in the mid-Columbia River. Don Chapman Consultants, Inc. Boise, ID. 235 pp.

Chilcote, M.W., S.A. Leider, and J.J. Loch. 1986. Differential reproductive success of hatchery and wild summer-run steelhead under natural conditions. Transactions of the American Fisheries Society. 115:726-735.

CBFWA (Columbia Basin Fish and Wildlife Authority). 1996. Draft programmatic environmental impact statement - impacts of artificial salmon and steelhead production strategies in the Columbia River basin. USFWS, NMFS, and Bonneville Power Administration. Portland, OR. December 10, 1996 draft.

Cuenco, M.L., T.W.H. Backman, and P.R. Mundy. 1993. The use of supplementation to aid in natural stock restoration. J.G. Cloud and G.H. Thorgaard, editors. Pages 269-293 In: Genetic Conservation of Salmonid Fishes. Plenum Press, New York.

Dawley, E.M., R.D. Ledgerwood, T.H. Blahm, C.W. Sims, J.T. Durkin, R.A. Kirn. A.E. Rankis, G.E. Monan, and F.J. Ossiander. 1986. Migrational characteristics, biological observations, and relative survival of juvenile salmonids entering the Columbia River estuary, 1966-1983. Final Report to Bonneville Power Administration, 256 p. Available Bonneville Power Administration, P.O. Box 351, Portland, OR 97208.

Eltrich, R., K. Petersen, A. Mikkelsen, and M. Tonseth. 1994a. Summary report of the 1990 brood sockeye and chinook salmon stocks reared at Rock Island fish hatchery complex facilities. Hatcheries Program, Assessment and Development Division, Wash. Dept. Fish and Wildlife, Olympia, WA.

Eltrich, R., K. Petersen, and A. Mikkelsen. 1994b. Summary report of the 1991 brood sockeye and chinook salmon stocks reared and released at Rock Island fish hatchery complex facilities. Hatcheries Program, Assessment and Development Division, Wash. Dept. Fish and Wildlife, Olympia, WA.

Eltrich, R., K. Petersen, M. Tonseth, and A. Mikkelsen. 1995. Summary report of the 1992 brood sockeye and chinook salmon stocks reared and released at Rock Island fish hatchery complex facilities. Report # H95-12. Hatcheries Program, Assessment and Development Division, Wash. Dept. Fish and Wildlife, Olympia, WA.

ESA. 1973. Endangered Species Act of 1973 - as amended through 1988. Senate and House of Representatives of the United States of America. 75 pp.

FPC (Fish Passage Center). 1987. 1986 Annual Report. Project Number 86-60. Bonneville Power Administration. Portland, Oregon.

Ford, M., P. Budy, C. Busack, D. Chapman, T. Cooney, T. Fisher, J. Geiselman, T. Hillman, J. Lukas, C. Peven, C. Toole, E. Weber, and P. Wilson. 2001. Upper Columbia River steelhead and spring chinook salmon population structure and biological requirements. NMFS, NWFSC. Upper Columbia River Steelhead and Spring Chinook Biological Requirements Committee Final Report.

Fuss, H.J., C. Ashbrook, and J. Byrne. 1997. Mitchell Act hatcheries evaluation report. Report # H97-04. Assessment and Development division, Hatcheries Program, Washington Dept. Fish and Wildlife. Olympia, WA.

Hard, J.J., R.P. Jones, M.R. Delarm, and R.S. Waples. 1992. Pacific salmon and artificial production under the Endangered Species Act. Technical Memorandum NMFS- NWFSC-2. NOAA, U.S. Dept. Of Commerce. 56 pp.

Hawkes, L.A., R.D. Martinson, and W.W. Smith. 1992. Monitoring of Downstream Salmon and Steelhead at Federal Hydroelectric Facilities - 1991. Annual Report for Bonneville Power Administration, Project 84-14.

Hulett, P.L., C.W. Wagemann, and S.A. Leider. 1996. Studies of hatchery and wild steelhead in the lower Columbia region. Progress report for fiscal year 1995. Fish Management Program Report RAD 96-01, Washington Department of Fish and Wildlife, Olympia. 22 pp.

IHOT (Integrated Hatchery Operations Team). 1995. Policies and procedures for Columbia Basin anadromous salmonid hatcheries. Annual Report 1994. Bonneville Power Administration, Portland, OR. Project Number 92-043.

----------. 1996. Operation plans for anadromous fish production facilities in the Columbia River basin. Volume III - Washington. Annual Report 1995. Bonneville Power Administration, Portland, OR. Project Number 92-043. 536 pp.

Johnsen, R.C., L.A. Hawkes, W.W Smith, G.L. Fredricks, R.D. Martinson and W.A. Helvin. 1990. Monitoring of Downstream Salmon and Steelhead at Federal Hydroelectric Facilities - 1989. Annual Report for Bonneville Power Administration, Project 84-14.

Leider, S.A., P.L. Hulett, J.J. Loch, and M.W. Chilcote. 1990. Electrophoretic comparison of the reproductive success of naturally spawning transplanted and wild steelhead trout through the returning adult stage. Aquaculture 88: 239-252.

MCMCP (Mid-Columbia Mainstem Conservation Plan). 1997. Hatchery program - working draft (24) July, 1997. Washington Department Fish and Wildlife, Olympia. 78 pp

Martin, S.W., A.E. Viola, and M.L. Schuck. 1993. Investigations of the interactions among hatchery reared summer steelhead, rainbow trout, and wild spring chinook salmon in southeast Washington. Report #93-4. Washington Department Fish and Wildlife, Olympia. 33 pp.

National Marine Fisheries Service. 1995. Biological Opinion for 1995 to 1998 hatchery operations in the Columbia River Basin. NOAA/NMFS, April 5, 1995. 82 pp.

----------. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon, and California. NOAA Tech. Memo. NMFS-NWFSC-27. National Tech. Information Service, U.S. Dept. of Commerce. Springfield, VA. 261 pp.

----------. 1999. Biological Opinion on Artificial propagation in the Columbia River basin. Incidental take of listed salmon and steelhead from Federal and non-Federal hatchery programs that collect, rear and release unlisted fish species. NOAA/NMFS, March 29, 1999. 175 pp.

----------. 2002. Letter from Bob Lohn, NMFS, to F. L. Cassidy, Jr., NWPPC. Interim abundance and productivity targets for interior Columbia Basin salmon and steelhead listed under the Endangered Species Act (ESA), April 4, 2002.

Pearsons, T.N., G.A. McMichael, S.W. Martin, E.L. Bartrand, M. Fischer, and S.A. Leider. 1994. Yakima River species interaction studies - annual report 1993. Project No. 89- 105. Bonneville Power Administration, Portland, Oregon. 247 pp.

Petersen, K., R. Eltrich, and A. Mikkelsen. 1994. Downstream movement and emigration of chinook salmon from the Chiwawa River in 1992/1993. Hatcheries Program Assessment and Development Division. Wash. Dept. Fish and Wildlife, Olympia. 46 pp.

Petersen, K., R. Eltrich, A. Mikkelsen, and M. Tonseth. 1995. Downstream movement and emigration of chinook salmon from the Chiwawa River in 1994. Hatcheries Program Assess. and Development Division. Wash. Dept. Fish and Wildlife, Olympia. 37 pp.

Peven, C.M. 1990. The life history of naturally produced steelhead trout from the mid-Columbia River basin. M.S. Thesis, University of Washington. Seattle.

Peven, C.M., D.H. Sheffield, and P.C. Fielder. 1987. Rock Island Dam smolt monitoring, 1987. Final Report. Fish and Wildlife Operations, Power Operations Dept. PUD No. 1 of Chelan County. Bonneville Power Administration. Project No. 84-54.

Peven, C.M. and P.C. Fielder. 1988. Rock Island Dam smolt monitoring, 1988. Final Report. Fish and Wildlife Operations, Power Operations Dept. PUD No. 1 of Chelan County. Bonneville Power Administration. Project No. 84-54.

----------. 1989. Rock Island Dam smolt monitoring, 1989. Final Report. Fish and Wildlife Operations, Power Operations Dept. PUD No. 1 of Chelan County. Bonneville Power Administration. Project No. 84-54.

----------. 1990. Rock Island Dam smolt monitoring, 1990. Final Report. Fish and Wildlife Operations, Power Operations Dept. PUD No. 1 of Chelan County. Bonneville Power Administration. Project No. 84-54.

Phelps, S.R., S.A. Leider, P.L. Hulett, B.M. Baker, and T. Johnson. 1997. Genetic analysis of Washington steelhead: preliminary results incorporating 36 new collections from 1995 and 1996. Progress Report. Washington Department Fish and Wildlife, Olympia. 54 pp.

Public Utility District No. 1 of Chelan County, Washington; National Marine Fisheries Service; U.S. Fish and Wildlife Service; Washington Department of Fish and Wildlife; Confederated Tribes of the Colville Reservation; Confederated Tribes and Bands of the Yakama Indian Nation; Confederated Tribes of the Umatilla Indian Reservation; American Rivers, Inc. 2002a. Anadromous fish agreement and habitat conservation plan. Rock Island Hydroelectric Project. FERC License No. 943. 56pp.

Public Utility District No. 1 of Chelan County, Washington; National Marine Fisheries Service; U.S. Fish and Wildlife Service; Washington Department of Fish and Wildlife; Confederated Tribes of the Colville Reservation; Confederated Tribes and Bands of the Yakama Indian Nation; Confederated Tribes of the Umatilla Indian Reservation; American Rivers, Inc. 2002b. Anadromous fish agreement and habitat conservation plan. Rocky Reach Hydroelectric Project. FERC License No. 2145. 57pp.

Public Utility District No. 1 of Douglas County, Washington; National Marine Fisheries Service; U.S. Fish and Wildlife Service; Washington Department of Fish and Wildlife; Confederated Tribes of the Colville Reservation; Confederated Tribes and Bands of the Yakama Indian Nation; Confederated Tribes of the Umatilla Indian Reservation; American Rivers, Inc.; Puget Sound Energy; Portland General Electric; Pacificorp; Avista Corporation. 2002. Anadromous fish agreement and habitat conservation plan. Wells Hydroelectric Project. FERC License No. 2149. 81pp.

Rawding, D. 2000. A methodology for estimating the adult wild winter steelhead sportfishing mortality in tributaries to the lower Columbia River. WDFW unpub. rep. 16pp.

Schiewe, M. H. 1997. Memorandum from M. H. Schiewe, NMFS, to G. Griffin, NMFS. Review of section 10 direct take permit application from Washington Department of Fish and Wildlife, Upper Columbia River steelhead. October 7, 1997.

Steward, C.R. and T.C. Bjornn. 1990. Supplementation of salmon and steelhead stocks with hatchery fish: a synthesis of published literature. Tech. Rpt. 90-1. Idaho Cooperative Fish and Wildlife Research Unit. University of Idaho, Moscow, ID.

SIWG (Species Interaction Work Group). 1984. Evaluation of potential interaction effects in the planning and selection of salmonid enhancement projects. J. Rensel, chairman and K. Fresh editor. Report prepared for the Enhancement Planning Team for implementation of the Salmon and Steelhead Conservation and Enhancement Act of 1980. Washington Dept. Fish and Wildlife. Olympia, WA. 80 pp.

Washington Department of Fisheries (WDF), Washington Department of Wildlife (WDW), and Western Washington Treaty Indian Tribes (WWTIT). 1993. 1992 Washington State salmon and steelhead stock inventory (SASSI). Wash. Dept. Fish Wildlife, Olympia, 212 p. and 5 regional volumes. Washington Dept. Fish and Wildlife, 600 Capitol Way N, Olympia, WA. 98501-1091.

Washington Department of Fish Wildlife (WDFW). 1997. Policy of Washington Department of Fish and Wildlife and Western Washington Treaty Tribes Concerning Salmonids. Washington Department of Fish and Wildlife. Olympia, WA.

Washington Department of Fish and Wildlife (WDFW). 2001. Upper Columbia steelhead management conservation plan. Washington Department of Fish and Wildlife, Olympia, WA. 102 pp.

Washington Department of Fish and Wildlife (WDFW), and Oregon Department of Fish and Wildlife (ODFW). 2000. Status report - Columbia River fish runs and fisheries, 1938 - 1999. Joint Columbia River Management Staff. Battle Ground, Washington/Clackamas, Oregon. 296 pp.

Witty, K., C. Willis, and S. Cramer. 1995. A review of potential impacts of hatchery fish on naturally produced salmonids in the migration corridor of the Snake and Columbia rivers. Comprehensive Environmental Assessment - Final Report. S.P Cramer and Associates. Gresham, OR. 76 pp.

Section 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

14.1 Certification Language and Signature of Responsible Party

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

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

Take Table 1. Estimated listed salmonid take levels by hatchery activity. See also Permit #1395.
Steelhead

ESU/Population	Upper Columbia Steelhead
Activity	Upper Columbia Steelhead Programs
Location of hatchery activity	Rock Island Hatchery Complex Facilities including Trapping sites at Wells Dam, Wenatchee and Methow Rivers, rearing and release from the Wenatchee, Methow and Okanogan Systems.
Dates of activity	May – May
Hatchery Program Operator	WDFW

Type of Take	Annual Take of Listed Fish by life Stage (number of fish)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass (a)			Research activities as spelled out in the permit.[2]	
Collect for transport (b)			373[1]	
Capture, handle, and release (c)			Dependent on yearly run[2]	
Capture, handle, tag/mark/tissue sample, and release (d)			Dependent on yearly run.[2]	
Removal (e.g., broodstock (e)			Same as section b.[2]	
Intentional lethal take (f)			Same as section b.[2]	
Unintentional lethal take (g)	Up to 25%[3]		Up to 10% of the adults held as spelled out in the permit.[2]	
Other take (specify) (h)		Up to 320,000^		

[1] Wentachee portion of the ESA Section 10 permit (based on program objective of up to 33% naturally produced origin broodstock. Actual numbers will be dictated by run-at-large composition each year and the efficacy of alternative broodstock collection measures (1.e. selective hook and line collection).
[2] See Permit #1395 Annual reports.
[3]Loss from fingerling to release due to all causes including disease. Based on a 75% survival for the rearing for all UCR steelhead programs from the rearing of 1,030,000 eggs for the ESU including transfers to Winthrop NFH and Ringold Springs FH. Approximately 257,500 are listed as "indirect" mortality to account for fish lost, mostly as green eggs.

^ Rearing, transport and release to acclimation sites as specified in permit 1395.

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	Wenatchee Basin/Chiwawa River Spring Program
Location of hatchery activity	Rock Island Hatchery Complex Facilities including Trapping sites on the Wenatchee River, spawning and rearing at Eastbank Hatchery and release form Chiwawa Ponds.
Dates of activity	May – May
Hatchery Program Operator	WDFW

Type of Take	Annual Take of Listed Fish by life Stage (number of fish)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass (a)			Research activities as spelled out in the permit.[2]	
Collect for transport (b)				
Capture, handle, and release (c)			Dependent on yearly run at Wells	
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^	

[1] Permit #1395.

^The level of "unintentional mortality" of listed adult hatchery, supplementation, and wild origin Upper Columbia ESU steelhead resulting from hook-and-line broodstock collection activites is estimated to be less than 1 fish, based upon expected injuries to fish hooked but not landed.

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.

Appendix 1 (Table 1.2)

Table 1-2. Projected adult steelhead returns above Wells Dam resulting from smolt production of 550,000 and 618,2500 smolts and smolt to adult rates (SAR"s) consistent with observed SAR's for brood years 1981-1996.

Percentile	SAR	# smolts released	# smolts required	Hatchery Adult Return	/1 Wild Return	/2 Pre-spawn Survival	Hatchery Spawning Escapement	Wild Spawning Escapement	Total	Interim Recovery Goal /3	Shortfall
0.00	0.21	550,000		1,129	125	0.95	1,073	119	1,192	3,100	-1,908
			618,250	1,270	141	0.95	1,206	134	1,340	3,100	-1,760
0.01	0.23	550,000		1,264	140	0.95	1,201	133	1,334	3,100	-1,766
			618,250	1,421	158	0.95	1,350	150	1,500	3,100	-1,600
0.05	0.33	550,000		1,801	200	0.95	1,711	190	1,901	3,100	-1,199
			618,250	2,025	225	0.95	1,924	214	2,137	3,100	-963
0.10	0.39	550,000		2,140	238	0.95	2,033	226	2,259	3,100	-841
			618,250	2,405	267	0.95	2,285	254	2,539	3,100	-561
0.15	0.43	550,000		2,344	260	0.95	2,227	247	2,474	3,100	-626
			618,250	2,635	293	0.95	2,503	278	2,781	3,100	-319
0.20	**0.47**	**550,000**		**2,612**	**290**	**0.95**	**2,482**	**276**	**2,758**	**3,100**	**-342**
			618,250	**2,937**	**326**	**0.95**	**2,790**	**310**	**3,100**	**3,100**	**0**
0.25	0.49	550,000		2,693	299	0.95	2,559	284	2,843	3,100	-257
			618,250	3,027	336	0.95	2,876	320	3,196	3,100	96
0.29	**0.53**	**550,000**		**2,937**	**326**	**0.95**	**2,790**	**310**	**3,100**	**3,100**	**0**
0.30	0.54	550,000		2,984	332	0.95	2,835	315	3,150	3,100	50
			618,250	3,355	373	0.95	3,187	354	3,541	3,100	441
0.35	0.59	550,000		3,268	363	0.95	3,104	345	3,449	3,100	349
			618,250	3.673	408	0.95	3,489	388	3,877	3,100	777

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