HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	Ringold Springs Steelhead Program
Species or Hatchery Stock	Summer Steelhead- *Oncorhynchus Mykiss* Wells Hatchery Summer Steelhead Stock
Agency/Operator	WDFW
Watershed and Region	Mid-Columbia Subbasin
Date Submitted	-
Date Last Updated	January 18, 2005

Section 1: General Program Description

1.1 Name of hatchery or program.

Ringold Springs Summer Steelhead

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

Wells Summer Steelhead - *Oncorhynchus mykiss*

ESA Status: Both wild and hatchery steelhead in the Upper Columbia River ESU are listed as Endangered (8/18/1997).

1.3 Responsible organization and individuals.

Name (and title):	Mike Lewis
	Complex Manager
Agency or Tribe:	Washington Department of Fish & Wildlife
Address:	1871 Ringold River Road, Mesa, WA 99343-9601
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program.

Co-operators	Role
National Marine Fisheries Service	Administrator of Mitchell Act Hatchery Program Funds

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

Funding Sources
Mitchell Act

Operational Information	Number
Full time equivalent staff	3
Annual operating cost (dollars)	$178,000

1.5 Location(s) of hatchery and associated facilities.

Broodstock source	Wells Hatchery
Broodstock collection location (stream, RKm, subbasin)	Wells Hatchery, Columbia River, RKm 861, Upper Middle Columbia Subbasin
Adult holding location (stream, RKm, subbasin)	Wells Hatchery, Columbia River, RKm 861, Upper Middle Columbia Subbasin
Spawning location (stream, RKm, subbasin)	Wells Hatchery, Columbia River, RKm 861, Upper Middle Columbia Subbasin

Incubation location (facility name, stream, RKm, subbasin)	Wells Hatchery, Wells Dam, RKm, 861 Upper Middle Columbia; and Klickitat Hatchery, Klickitat River, RKm 68, Klickitat Subbasin
Rearing location (facility name, stream, RKm, subbasin)	Early rearing to sub-yearling stage takes place at Klickitat Hatchery, Klickitat River, RKm 68, Klickitat Subbasin, and Ringold Hatchery, Spring Creek/Columbia River, RKm 567 Final rearing to smolt stage and release takes place at Ringold Hatchery located on the mainstem Columbia River, WA - 348.3 miles from the mouth of the Columbia River. The hatchery is about 17 miles west of Mesa, WA.

1.6 Type of program.

Isolated Harvest*

1.7 Purpose (Goal) of program.

Mitigation: Rear and release up to 180,000 adipose fin clipped and right ventral marked steelhead smolt to provide targeted sport fisheries and contribute to tribal fisheries to mitigate for activities within the Columbia River basin, which has reduced salmon and steelhead populations due to federal hydropower and habitat degradation in the Columbia River Basin.

*Conservation: The intent of the program is a hatchery segment of the Wells UCR ESU stock component although the Wells stock is used for both integrated recovery and harvest**.** Although the main focus is on harvest, this program can provide a source of Upper Columbia River (UCR) Wells steelhead if needed. Adult steelhead returning to the Ringold facility have been designated as a "ESU-reserve stock" for the lower geographic Upper Columbia ESU. In this reserve role, Ringold could provide adults if warranted, although these fish have not been needed in this role since the program changed from non-local steelhead to UCR stock (Wells) in 1998.

1.8 Justification for the program.

The program will be operated to provide fish for harvest while minimizing adverse affects on listed fish. Hatchery salmon and steelhead are released into the Columbia River and mitigates for the loss of wild salmon and steelhead harvest in sport, commercial, and tribal fisheries due to federal hydropower construction and habitat degradation in the Columbia River Basin. The hatchery fish produced by this program provide fish in sufficient number to meet harvest goals in the fisheries intended to benefit from the program. Harvest of steelhead in freshwater, and tribal fisheries reduces the number of hatchery-produced steelhead that may escape to potentially spawn in mid and upper Columbia tributaries.

The targeted fishery is in the mainstem Columbia, adjacent to the Ringold Springs Hatchery area. A bank and boat fishery targets the AD/RV mass marked fish while differentially marked UCR steelhead cannot be retained. In order to minimize harvest affects in the Ringold Springs area on listed fish, WDFW has submitted a Fisheries Management and Evaluation Plan (FMEP) to regulate recreational fisheries in the Mid-Columbia River (MCR), Washington State Salmon Recovery Region. A final draft (March 7, 2003) was submitted to NOAA for approval and is still in process. The objectives of the WDFW Fishery Management Evaluation Plan (FMEP) are based on the WDFW Wild Salmonid Policy (WDFW 1997). This policy states that harvest rates will be managed so that: 1) spawners are abundant enough to utilize all available habitats, 2) numbers and distribution of locally adapted spawning populations will not decrease, 3) genetic diversity within populations is maintained or increased, 4) natural ecosystem processes are maintained or restored,

and 5) sustainable surplus production, above levels needed to utilize all available habitats and provide for local adaptation, genetic diversity, and ecosystem processes, will be managed to support fishing opportunities (WDFW 1997). In addition, fisheries will be designed to ensure adult size, run timing, distribution of migrating and spawning populations, and age at maturity remains the same between fished and unfished populations. By complying with this policy, fishery impacts to listed chinook and steelhead in the MCMA will be managed to promote the recovery of these species, and at rates that will not jeopardize their survival or recovery.

The Ringold Hatchery is located upstream of the listed Middle Columbia River steelhead and downstream of listed Upper Columbia spring chinook and steelhead spawning, rearing habitat and migration pathways. The WDFW uses gear, timing, and harvest regulations to optimize harvest of targeted fish and minimize impacts to listed fish. If WDFW determines through monitoring activities that risks are unacceptable to listed stocks, timing, area, and gear restrictions will be adjusted. WDFW has an application for the renewal of ESA Section 10 # 1248 (pending as of August 30, 2004) for any incidental take of listed UCR spring Chinook and USR listed summer steelhead created by the Ringold summer steelhead harvest.

In order to minimize impact on listed fish by WDFW facilities operation, the following Risk Aversion are included in this HGMP:

Table 1. Summary of risk aversion measures for the Ringold Spring steelhead program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.2	Water rights are formalized through trust water right S3-283301 and S3-27816 from the Department of Ecology. Monitoring and measurement of water usage is reported in monthly NPDES reports.
Intake Screening	4.2	The spring water gravity supply is non-fish bearing. If using the river pump, the intake barrel screen is screened at 1 mm openings.
Effluent Discharge	4.2	This facility operates and complies with limits under the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) administered by the Washington Department of Ecology (DOE) - WAG 13-7009 and IHOT 1995 which act to protect the quality of receiving waters adjacent to the hatchery.
Broodstock Collection & Adult Passage	7.9	Listed fish are not collected for this program. There are no adult passage issues with this program.
Disease Transmission	7.9, see also 10.11	Fish Health Policy in the Columbia Basin. Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (Genetic Policy Chapter 5, IHOT 1995).
Competition & Predation	See also 2.2.3, 10.11	Current risk aversions and future considerations are being reviewed and evaluated for further minimizing impacts to listed fish.

1.9 List of program "Performance Standards".

See Section 1.10 below.

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

1.10.1 Benefits:

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Assure that hatchery operations support Columbia River fish Mgt. Plan *(US v Oregon)*, production and harvest objectives.	Contribute to a meaningful harvest for sport, tribal and commercial fisheries. Achieve a 10-year average catch of 1627 fish in the area from Highway 395 to Priest Rapids Dam.	Survival and contribution to fisheries will be estimated for each brood year released. Work with co-managers to manage adult fish returning in excess of broodstock need.
Maintain outreach to enhance public understanding, participation and support of Washington Department of Fish & Wildlife (WDFW) hatchery programs.	Provide information about agency programs to internal and external audiences. For example, local schools and special interest groups tour the facility to better understand hatchery operations. Off station efforts may include festivals, classroom participation, stream adoptions and fairs.	Evaluate use and/or exposure of program materials and exhibits as they help support goals of the information and education program. Record on-station organized education and outreach events.
Program contributes to fulfilling tribal trust responsibility mandates and treaty rights.	Follow pertinent laws, agreements, policies and executive and judicial orders on consultation and coordination with Native American tribal governments	Participate in annual coordination meetings between the co-managers to identify and report on issues of interest, coordinate management, and review programs (FBD process).
Implement measures for broodstock management to maintain integrity and genetic diversity. Measures are outlined in Permit 1395.	A minimum of 373 adults are collected throughout the spawning run in proportion to timing, age and sex composition of return	Annual run timing, age and sex composition and return timing data are collected. Adhere to WDFW spawning guidelines. (WDFW 1983) and measures outlined in Permit 1395.
Region-wide, groups are marked in a manner consistent with information needs and protocols to estimate impacts to natural and hatchery origin fish.	Use mass-mark (adipose-fin clip) and additional RV clip for selective fisheries in order to differentiate from VIE and PIT tags used for UCR tributaries.	Returning fish are sampled throughout their return for length, sex, and marks.
Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens. Follow Co-managers Fish Health Disease Policy (1998).	Necropsies of fish to assess health, nutritional status, and culture conditions	WDFW Fish Health Section inspect adult broodstock yearly for pathogens and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, WDFW's Fish Health Section recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as deemed necessary A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.
	Release and/or transfer exams for pathogens and parasites	1 to 6 weeks prior to transfer or release, fish are examined in accordance with the Co-managers Fish Health Policy
	Inspection of adult broodstock for pathogens and parasites	At spawning, lots of 60 adult broodstock are examined for pathogens
	Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens and parasites	Control of specific fish pathogens through eggs/fish movements are conducted in accordance to Co-managers Fish Health Disease Policy.

1.10.1 Risks:

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Minimize impacts and/or interactions to ESA listed fish.	Hatchery operations comply with all state and federal regulations. Hatchery juveniles are raised to smolt-size (4.5 fish/lb) and released from the hatchery at a time that fosters rapid migration downstream. Mass mark production fish to identify them from naturally produced fish.	As identified in the HGMP: Monitor size, number, date of release and mass mark quality. Additional WDFW projects: straying, instream evaluations of juvenile and adult behaviors, NOR/HOR ratio on the spawning grounds, fish health documented.
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
Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring.	NPDES permit compliance WDFW water right permit compliance	Flow and discharge reported in monthly NPDES reports.
Water withdrawals and instream water diversion structures for hatchery facility will not affect spawning behavior of natural populations or impact juveniles.	Hatchery intake structures meet state and federal guidelines where located in fish bearing streams.	Visual observations recorded. Barrier and intake structure compliance assessed and needed fixes are prioritized.
Hatchery operations comply with ESA permits and responsibilities.	WDFW completes an HGMP and is issued a federal and state permit when applicable.	Identified in HGMP and Biological Opinion for hatchery operations.
Harvest of hatchery-produced fish minimizes impact to wild populations.	Harvest is regulated to meet appropriate biological assessment criteria. Mass mark juvenile hatchery fish prior to release to enable state agencies to implement selective fisheries.	Harvests are monitored by agencies and tribes to provide up to date information.

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

Broodstock are collected at Wells Hatchery. 373 - 420 adults are needed to meet Wells Hatchery goals for the Upper Columbia River production for the Methow and Okanogan Rivers and for the Ringold Springs Hatchery program (See also NMFS Section 10 (a)(1)(b) Permit for Take of Endangered or Threatened Species #1347). 240,000 eyed eggs are needed for the Ringold program which requires approximately 45 females depending on seasonal fecundities.

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

Age Class	Release Goal	Size (ffp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Water-shed	Eco-province
Yearling	180,000	4.5 – 5.0	April-May	Spring Creek/ Tributary to Columbia River (RKm 567)	567.0	Upper-Middle Columbia River	Columbia Plateau

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

Smolt-to-adult survival rates from Ringold releases are not available, however, many of the 2002 brood released in 2003 were PIT tagged. One-salt returns over McNary Dam in 2004 show a survival rate of 1.32% for those releases (Army Corp of Engineers 2004). This is 60% of the total fish expected back from the 2003 releases (40% +/- will be 2-salt fish), so the survival rate would be expected to increase. For comparison, from the Methow Basin PIT tagged releases of the same brood year (and for the same study), one salt return survival is averaging 0.365% for smolts having to pass multiple dams.

Past data from UCR studies (Wenatchee and Methow) indicate that from brood year 1981 through brood year 1996, smolt-to-adult survival for Wells Hatchery steelhead stock has ranged from 0.29% to 7.54 %, with a median survival of 0.92% and a mean survival of 1.63 % (WDFW 2002). Sport harvest occurs in the targeted Ringold bank fishery but also in the Columbia mainstem downstream of the hatchery location.

Table 1. Sport harvest figures from Highway 395 to Priest Rapids Dam in the Ringold Hatchery area.

Return Year	Harvest		
	Hatchery	Wild	H&W Total
1978/79	Na	1,852	Na
1979/80	Na	1,777	Na
1980/81	Na	1,980	Na
1981/82	2,950	1,719	4,669
1982/83	1,099	1,766	2,865
1983/84	706	1,712	2,418
1984/85	2,443	1,749	4,192
1985/86	3,069	1,647	4,716
1986/87	3,353	2,349	5,702
1987/88	2,178	89	2,267
1988/89	3,928	0	3,928
1989/90	3,680	0	3,680
1990/91	3,678	0	3,678
1991/92	3,561	73	3,634
1992/93	3,589	153	3,742
1993/94	2,212	64	2,276
1994/95	1,937	66	2,003
1995/96	1,490	20	1,510
1996/97	2,748	94	2,842
1997/98	1,405	12	1,417
1998/99	1,102	22	1,124
1999/00	1,203	12	1,215
2000/01	2,334	36	2,370
2001/02	1,642	13	1,655
2002/03	1362+	48+	1410+
2003/04	Na	Na	Na

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

The first year of operation for this hatchery was 1963. Steelhead releases from this facility have occurred for years as a Washington Department of Game facility until the merger with the Washington Department of Fisheries as the Washington Department of Fish and Wildlife in 1996. Until 1998, a non-endemic steelhead stock was used. In 1999, the stock was switched to Wells UCR ESU stock.

1.14 Expected duration of program.

The program is on-going with no planned termination.

1.15 Watersheds targeted by program.

Middle Columbia River and secondarily the Upper Columbia River tributaries.

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

1.16.1 Brief Overview of Key Issues

New construction of incubation and early rearing facilities would allow full term rearing of Wells stock steelhead. This would include accessing additional surface water available but currently not used due to plumbing restrictions. The ability to chill the water would be required as well. Facility problems; particularly in relation to the 5-acre pond (same problems as 9 acre pond), water supply, avian predation, trap shortcomings, lack of incubation and early rearing, facility maintenance and upgrades, etc. The "temporary" vinyl raceways built in the 1960's as a 10-year short-term fix are still in use, and need to be replaced with modern, concrete raceways. Dependence on other facilities for incubation and early rearing is problematic. For example, Klickitat currently completes egg incubation and early rearing. If this facility is turned over to the Yakama Nation, this may no longer be possible.

1.16.2 Potential Alternatives to the Current Program

Develop local broodstock to avoid dependence on other facilities, and to avoid straying. This would only be possible if the facility was upgraded for full term rearing.

1.16.3 Potential Reforms and Investments

The entire Ringold facility needs major modifications, repairs and upgrades, including: tying in alarm points from ponds, intakes and concrete raceways to existing alarm system, with relocation of the siren. Installing permanent bird predation systems over all rearing vessels. Concrete the entire floor of the trap holding area, including installation of removable holding pens, removable pickets, ecology blocks downstream, and completion of the brail loading system. There is a need to address various safety and leakage concerns on intakes, outlets and other water delivery systems. Completely replace 9 acre outlet structure and pipe to creek. Construct new feed, equipment, and chemical storage building with loading dock and domestic well building. Replace siding on the main hatchery building, including installation of roof vents, heaters, and both residences. A need to address multiple concerns with in river pump intake. These include construction of a log boom and trash rack, a waterproof chamber for housing the river intake and compressor. No adult spawning or incubation is currently possible at this facility due to excessively high water temperatures, making it dependant on other hatcheries for egg take and early rearing.

Section 2: Program Effects on ESA-Listed Salmonid Populations

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

Permit 1395 - Direct Take (artificial propagation to enhance ESA-listed steelhead) authorizes annual take of adult and juvenile, endangered, upper Columbia River (UCR) spring chinook salmon and endangered UCR steelhead through broodstock collection activities, hatchery operations, juvenile fish releases, and monitoring and evaluation activities associated with UCR steelhead artificial propagation programs in the UCR region.

WDFW has applied for the renewal of ESA Section 10 # 1248 (pending as of August 30, 2004) for any incidental take of listed UCR spring Chinook and USR listed summer steelhead created by the Ringold summer steelhead harvest.

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

The following ESA listed natural salmonid populations occur in the subbasin where the program fish are released:

ESA listed stock	Viability	Habitat
Steelhead-Middle Columbia ESU	Na	Na
Steelhead- Upper Columbia ESU	Na	Na
Spring Chinook- Upper Columbia ESU	Na	Na
H, M and L refer to high, medium and low ratings, low implying critical and high healthy.		

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

Describe the status of the listed natural population (s) relative to "critical" and "viable" population thresholds.

Critical habitat was designated for UCR steelhead in 2000 when NMFS published a final rule in the Federal Register (65 FR 7764). However, the critical habitat designation for UCR steelhead was vacated and remanded to NMFS for new rulemaking pursuant to a court order in April 2002. The designation of critical habitat for the UCR steelhead ESU will trigger a reinitiating of ESA consultation.

Identify the ESA-listed population(s) that will be <u>directly</u> affected by the program.

Upper Columbia River Steelhead- *Oncorhynchus mykiss,* Listed as Endangered- 8/18/1997

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

Middle Columbia River Steelhead- *Oncorhynchus mykiss,* Listed as threatened- 3/25/1999
Upper Columbia River Spring-Run Chinook Salmon- *Oncorhynchus tshawytscha,* Listed as Endangered- 3/24/1999

Upper Columbia River Steelhead- *Oncorhynchus mykiss*
The UCR steelhead ESU includes all natural-origin populations of steelhead in the Columbia River basin upstream from the Yakima River, Washington, to the U.S./Canada border. Affects on UCR steelhead would be only once fish are in the mainstem corridor from the Hanford Reach downstream. The average 2000- 2003 return counted through the Priest Rapids Dam fish ladder was approximately 18,620 fish with 3049 wild fish. In contrast, the 1997-2001 return counted through the Priest Rapids Dam was approximately 12,900 fish. The average for the previous five

years (1992-1996) was 7,800 fish. Since 2000, ocean conditions have drastically improved resulting in 126% increase of Upper Columbia Steelhead returns from 2000 – 2002 with strong returns observed in 2003 and 2004 (NOAA Fisheries). By October 2004, over 18,000 steelhead had passed Priest Rapids Dam. The natural component of the annual steelhead run over Priest Rapids Dam increased from an average of 1,040 (1992-1996), representing about 15 percent of the total adult count, to 2,200 (1997-2001), representing about 17 percent of the adult count during this period of time (BRT 2003). In terms of natural production, recent population abundances for both the Wenatchee/Entiat river aggregate population and the Methow population remain well below the interim recovery levels developed for these populations (BRT 2003).

Steelhead production in the Hanford Reach is poorly documented and much of what is conjectured is based on anecdotal or circumstantial evidence. Direct observation and enumeration of steelhead spawning is difficult due to river conditions in spring. In 1968 and 1970, researchers observed 150 redds during limited surveys (T. Eldred, WDW, pers. comm.). Watson (1973) refers to unspecified amounts of steelhead spawning observed in aerial surveys during the same period. Anglers have reported catching gravid steelhead in the Hanford Reach (T. Eldred, WDW, pers. commun.).

Middle Columbia River Steelhead- *Oncorhynchus mykiss*

The MCR steelhead ESU includes all natural-origin populations in the Columbia River basin above the Wind River, Washington, and the Hood River, Oregon, including the Yakima River, Washington. The MCR includes the only populations of winter inland steelhead in the United States (in the Klickitat River, Washington, and Fifteenmile Creek, Oregon). Both the Deschutes River and Umatilla River hatchery stocks are included in the ESU, but are not listed. Critical habitat was designated for MCR steelhead on February 16, 2000 (65 FR 7764). The NMFS, in listing this ESU as threatened, cited low returns to the Yakima River, poor abundance estimates for Klickitat River and Fifteenmile Creek winter steelhead, and an overall decline for naturally-producing stocks within the ESU. Ringold Springs Hatchery is located in the UCR ESU which begins upstream of the Yakima River confluence and plants from this facility emigrate downstream through the ESU. Since 2000 though, ocean conditions improved resulting in 44% increase of Middle Columbia Steelhead returns from 2000 – 2002 (NOAA Fisheries).

Upper Columbia River Spring-Run Chinook Salmon- *Oncorhynchus tshawytscha*

The UCR spring-run chinook salmon ESU 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. The spring-run components of the following hatchery stocks are also listed: Chiwawa, Methow, Twisp, Chewuch, and White rivers and Nason Creek. Critical habitat was designated for UCR spring-run chinook salmon on December 28, 1993 (58 FR 68543). Ringold Springs Hatchery plants occur in the mainstem Columbia downstream of those major tributaries.

Three independent populations of spring-run chinook salmon are identified for the ESU including those that spawn in the Wenatchee, Entiat, and Methow basins (Ford et al. 1999). NMFS recently proposed interim recovery abundance levels and cautionary levels (i.e., interim levels still under review and subject to change). Ford et al. (1999) characterize cautionary levels as abundance levels that the population fell below only about 10% of the time during a historical period when it was considered to be relatively healthy. Escapements for UCR spring-run chinook salmon have been substantially below the cautionary levels in recent years, especially during 1995, indicating increasing risk to and uncertainty about the population's future status. On the other hand, returns for 1999 and 2000, the primary return year for the 1995 and 1996 broods, indicate that although they were low, returns were generally higher than the contributing broodyears. Very strong 1999 and 2000 jack returns suggest that survival rates for the 1996 and 1997 brood were high, as well. Since 2000, ocean conditions drastically improved resulting in

91% increase of Upper Columbia Spring Chinook returns from 2000 – 2002 with strong returns observed in 2003 and 2004 (NOAA Fisheries).

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

Describe hatchery activities: The following activities are identified in the ESA Section 7 Consultation "Biological Opinion on Artificial Propagation in the Columbia River Basin" (March 29, 1999). Broodstock are taken at Wells Hatchery located on the mainstem Columbia River just below Wells Dam at river mile 515, and are covered under Direct take permit 1395. Incidental take are submitted at the end of this HGMP.

Broodstock Program:

Broodstock Collection: Listed broodstock for the Ringold program steelhead are collected at Wells Hatchery. Trapping and collection at Wells is limited to 3 days weekly and 16 hours per day. Up to 240,000 eggs could be taken for the Ringold Program which would involve approximately 45 spawning pairs. Mating crosses are Hatchery x Hatchery (H x H). Direct take for this broodstock operation is not included with this HGMP, See Section 10 Direct Take Permit 1395). Ringold Springs traps fall chinook and up to 2003, spring chinook that volitionally entered the trap in Spring Creek. Along with these stocks, listed UCR spring chinook and UCR steelhead may also enter the trapping facility at Ringold Springs. Hatchery steelhead with a right ventral fin clip are released into the Columbia River downstream of the hatchery location. Listed steelhead are transferred approximately 4 river miles upriver for release back to the Columbia River.

Genetic introgression: The Skamania type stock was eliminated from the program in 1997 and changed to Upper Columbia steelhead (Wells) stock. Return timing of Ringold fish are separated from the fish rearing programs in the Upper Columbia by selecting eggs from the earliest spawning cohorts. The intent has been for hatchery steelhead (H x H) crosses only. Currently, only Upper Columbia origin fish are used. Ringold steelhead (identified by a right ventral fin clip) that return to Wells Hatchery are not utilized in the broodstock program. Radio telemetry data in 2001-2002 indicate that some of the steelhead released into the Columbia River from the Ringold Springs program migrate back to the UCR area. In order to limit this, the Ringold Springs program has been maintained at levels below 200,000 smolts released until monitoring indicates that the fish are not passing upstream and posing an increased risk to the recovery efforts. 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, WDFW may remove artificially propagated steelhead at dams or other trapping sites. In addition, recreational fisheries may be used to reduce the number of adipose fin-clipped hatchery-reared steelhead that may spawn naturally (Section 10 Permit #1395).

Rearing Program:

Operation of Hatchery Facilities: After being transferred to Ringold, fish are reared from fall until the following spring. Vinyl rearing receptacles are being replaced with new polypropylene liners and support liners to prevent leakage. The Columbia River pump intake structure is screen compliant with NOAA but has been operationally difficult to use. The main intake collection box needs replacement to safeguard the water supply. WDFW has made assessments and forwarded recommendations of needed improvements for future funding assessment. Effluent is rapidly diluted by the Columbia River flows in this area. Flow and operations are within permitted discharge guidelines. Ringold Springs adheres to Clean Water Act Section 402 and meets or exceed NPDES Permit requirements (See HGMP Sections 4.1 and 4.2). Indirect take from this

operation is unknown.

Disease: Outbreaks in the hatchery may cause significant adult, egg, or juvenile mortality. Although hatchery populations can be reservoirs for disease pathogens because of their elevated exposure to high rearing densities and stress, there is little evidence to suggest that diseases are routinely transmitted from hatchery to natural fish (Steward and Bjornn 1990). Chapman et al. (1994) concluded that disease transmittal from hatchery to natural populations is likely not a major factor negatively affecting natural steelhead in the Columbia basin. To address concerns of potential disease transmission from hatchery to natural fish, the Pacific Northwest Fish Health Protection Committee (PNFHPC) has established guidelines to ensure hatchery fish are released in good condition, thus minimizing impacts on natural fish (PNFHPC). Over the years, rearing densities, disease prevention and fish health monitoring have greatly improved the health of the programs at Wells, Klickitat and Ringold Springs Hatcheries. Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1994) chapter 5 have been instrumental in reducing disease outbreaks. All Wells steelhead adults are viral sampled. Indirect take from disease is unknown.

Hatchery Production/Density-Dependent Effects: As the program is designed for harvest, fish are under heavy harvest selection and are imprinted to the Ringold Springs area to allow high harvest potentials. During the spring out-migration period, both large numbers of hatchery and wild smolts are migrating through the system rapidly which would minimize hatchery production density effects.

Competition: Salmon and steelhead feed actively during their downstream migration (Becker 1973; Muir and Emmelt 1988; Sager and Glova 1988) and if they do not migrate they can compete with wild fish. The SIWG (1984) concluded that, "migrant fish will likely be present for too short a period to compete with resident salmonids." Studies conducted in other areas indicate this program is likely to pose a minimal risk of competition due to the migration speed that smolted condition fish can travel:

1) Volitionally releases from large acclimation ponds can encourage rapid migration rates with approximately 20 river miles per day observed in the Cowlitz River (Harza 1998).
2) Once reaching the Columbia River, studies indicate that fish appear to travel quickly. In the area above Ringold, steelhead smolt travel time from the Methow River to McNary Dam (approximately 220 miles) ranges from 14 to 20 days (11-15 miles daily), dependent upon mainstem river flows (Chapman et al. 1994). Passive integrated transponder (PIT) tag research below Ringold at McNary, John Day, and Bonneville Dams indicate URB Chinook emigration rates of smolts at 50/fpp ranged from 8 – 15 miles daily.
3) In a study designed to define the migrational characteristics of chinook salmon, coho salmon, and steelhead trout in the Columbia River estuary, Dawley et al (1986), found the average migration rates for subyearling chinook, yearling chinook, and coho salmon and steelhead, were 22, 18, 17, and 35 RKm/d respectively.

Predation: Steelhead released from this program may prey upon listed species of salmonids, but the magnitude of predation will depend upon the characteristic of the listed population, the habitat in which the population occurs and the characteristics of the hatchery program (e.g.. release time, location, number released and size at release). In the absence of site-specific empirical information, the identification of risk factors can be a helpful tool for reviewing hatchery programs while monitoring and research programs are developed and implemented for steelhead research statewide.

Predation Risk Factors:

Environmental Characteristics: These characteristics can influence the level of predation (see SIWG 1984 for a review) with risk greatest in small systems during periods of low flow and high clarity. Steelhead releases coincide with listed juvenile fish migration from late March until fall but dispersal flows in the Columbia River increase during spring run-off and are augmented from increased water spilled over several dams to aid juvenile migration. Below Priest Rapids Dam, the main Columbia increases from 80,000 cfs to 104,000 cfs during April, 192,000 during May and peaks in June at 266,000 cfs (USGS real time data averages 1929 – 2002). The confluence with the Snake River at Tri-cities area can add another 20,000 cfs to augment the total mainstem Columbia River flow.

Dates of Releases: The release date can influence the likelihood that listed species are encountered. In the Columbia River corridor, numerous hatchery and wild fish stocks are moving through the migratory corridor from early spring to late summer. Ringold fish are released starting in mid-April. Research indicates steelhead smolts from the Upper Columbia Region pass Rock Island Dam from May 13 to May 23 (1985 observations reported in Fish Passage Center (FPC) 1987). The 1985-1989 average peak migration is May 18 (Peven and Fielder 1989). Steelhead smolts originating above McNary Dam, representing upper Columbia and Snake river origin populations, exhibit average peak passage at McNary Dam from May 7 through May 26 (1984- 86 observations reported in Fish Passage Center (FPC) 1987). Central 80 % passage of the out-migrating smolt population at McNary ranged between April 25 (10 %) and May 22 (90 %) based on 1984-86 smolt passage observations (FPC 1987). Release dates of the Ringold Springs program (mid – April) has occurred prior to these peaks. It is likely that this timeframe is later than listed Lower Columbia chum, which migrate from freshwater sooner than most salmonids and have vacated the Columbia system by early May. Listed steelhead smolts in the Lower Columbia are present in the corridor from March to June but are a yearling size smolt and are migrating in the corridor along with other steelhead stocks. Listed Lower Columbia River chinook migrate over a wide period from March to August in the corridor with the Ringold steelhead posing unknown risk to these stocks.

Relative Body Size: Studies and opinions on size of predator/prey relationships vary greatly and although there is evidence that salmonids can prey on fish up to 50% of their body length, most prey consumed is probably much smaller. Keeley and Grant (2001) suggest that the mean prey size for 100-200 mm fl salmonids is between 13-15% of predator body size. Salmonid predators were thought to be able to prey on fish up to approximately 1/3 of their length (USFWS 1994), although coho salmon have been observed to consume juvenile chinook salmon of up to 46% of their total length in aquarium environments (Pearsons et al. 1998). Artic char are well known as piscivorous predators, but recent studies suggest the maximum prey size is approximately 47% of their length (Finstad et al. 2002). The “33% of body length” criterion for evaluating the potential risk of predation in the natural environment has been used by NOAA Fisheries and the USFWS in a number of biological assessments and opinions (c.f., USFWS 1994; NMFS 2002). Although predation on larger chinook juveniles may occur under some conditions, WDFW believes that a careful review of the Pearson and Fritts (1999) study supports the continued use of the “33% of body length criterion” until further data for this system can be collected.

Release Location and Release Type: Ringold Springs releases fish downstream of the

major tributaries in the UCR ESU and geographically upstream of Mid and Lower Columbia ESUs. Release is from a large 5.0-acre acclimation pond with months of imprinting on the fish from spring and main river water. Studies on fish migration once they reach large river systems indicate that smolts can travel rapidly (See *Competition*).

Potential Ringold Springs summer steelhead predation and competition effects on listed salmonids:

The proposed annual production goal for this program is up to 180,000 fish at an average size of 4.5 fpp (220 mm fl). Fish are released volitionally from mid-April to May 1st. At 4.5 fpp, steelhead pose an unknown risk on listed fish of 72-73 mm fl and smaller. Indirect take from competition and predation is unknown.

Residualism: To maximize smolting characteristics and minimize residual steelhead, WDFW adheres to a combination of acclimation, volitional release strategies, pond management, size, and release guidelines (WDFW Steelhead Rearing Guidelines 2001). Condition factors including a .90-.99 K factor and co-efficient of variation (CVs) of less than 10% are the bases of these rearing guidelines. Based on PIT tag studies, successful migrants averaged 227 mm fl (4.1/lb) indicating selection for larger smolts exists on the Columbia River above Bonneville Dam (Mark Schuck, WDFW, personal communication). Steelhead management and feeding techniques are used to minimize the percentage of fish that are less than 180 mm fl and/or greater than 250 mm fl at release. Fish culture practices can include reducing feed in late summer/early fall if the program suspects accelerated growth that could lead to precocious males.

Migration Corridor/Ocean: Steelhead yearling migrational peaks in the Columbia River estuary have been observed to occur from the second through the fourth week in May (1978-83 data from Dawley et al. 1986). Considerable speculation, but little scientific information, is available concerning the overall effects to listed salmon and steelhead from the combined number of hatchery fish in the Snake/Columbia River migration corridor. Proposed maximum production for steelhead production from upper Columbia and the Ringold releases 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 180,000 steelhead smolts cannot be separated from all other smolt releases, nor can the effects of the entire release be determined at this time. NMFS has concluded 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.

Monitoring:

Associated monitoring and evaluation and research programs: Monitoring of juvenile UCR steelhead in the natural environment will be done using standard angling techniques and juvenile fish traps (i.e., rotary screw traps). These activities could encounter UCR spring chinook salmon. In previous years, no UCR spring chinook salmon have been encountered during sampling using standard angling techniques for residual UCR steelhead (Andrew Murdoch, WDFW personal communication, August 27, 2003). In the Biological Opinion for permit 1203 (NMFS 1999b), the WDFW assumed mortality of listed UCR spring chinook salmon would not exceed three percent. Based on experience since that time, the WDFW has revised the mortality impact to be less than two percent on target species. The incidental mortality of UCR spring chinook salmon would not

exceed one percent of the UCR spring chinook salmon captured. Considering that juvenile fish traps will likely not be operated in all tributary basins and not all traps will 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 and the impact to the ESU as whole is not substantial (Biological Opinion 2003 on permits 1395, 1396, and 1412).

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).
Direct take for bloodstock is covered by Permit 1395 at Wells. Incidental take during harvest seasons is covered under Permit 1248.

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.
Contingency plans are covered by Permit 1395 and Permit 1248.

Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.
Past takes associated with this program are covered by Permit 1395 and Permit 1248.

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 production developed for this program will be integrated with *U.S. v Oregon* and the Columbia River Fish Management Plan (CRFMP) and with hatchery plans documented in WDFW's yearly Future Brood Document (FBD), and 4d rules which has been agreed to by NOAA for listed steelhead and chinook in the ESU.

Steelhead production from Wells for the Methow and Wenatchee River systems for the Upper Columbia River ESU includes the production of Wells steelhead at Ringold Springs which is representative of the "lower" UCR steelhead ESU. Operation, monitoring and evaluation of these programs are aligned through the Chelan County PUD re-licensing HCP that started with the "Biological Assessment and Management Plan Mid-Columbia River Hatchery Program (1998)".

Current take permits from NOAA allow operational and harvest opportunity on the listed UCR steelhead programs if upriver escapement goals are reached. Potential changes to Ringold Hatchery programs in the future could be a result of mitigating effects of potential summer spill reductions at several Columbia River federal dams. Ringold Hatchery enhancement plans are to be able to allow full term facility production in the future as all programs from Ringold are dependent on other facilities to hold adults, incubate and hatch eggs, and early rear fish.

WDFW Operational Policies:

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

Genetic Manual and Guidelines for Pacific Salmon Hatcheries in Washington. These guidelines define practices that promote maintenance of genetic variability in propagated salmon (Hershberger and Iwamoto 1981). Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).

Spawning Guidelines for Washington Department of Fisheries Hatcheries. Assembled to complement the above genetics manual, these guidelines define spawning criteria to be use to maintain genetic variability within the hatchery populations (Seidel 1983). Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 7, IHOT 1995).

WDFW Steelhead Rearing Guidelines. Details rearing guidelines and rearing parameters statewide (July 31, 2001).

Stock Transfer Guidelines. This document provides guidance in determining allowable stocks for release for each hatchery. It is designed to foster development of locally adapted broodstock and to minimize changes in stock characteristics brought on by transfer of non-local salmonids (WDF 1991).

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

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

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

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

- 1998 Biological Assessment and Management Plan Mid-Columbia River Hatchery Program April 1998.
- ESA Direct, indirect and incidental take permits
- The Columbia River Fish Management Plan
- U.S. vs. Oregon court decision
- Production Advisory Committee (PAC)
- Technical Advisory Committee (TAC)
- Integrated Hatchery Operations Team (IHOT) Operation Plan 1995 Volume III.
- Pacific Northwest Fish Health Protection Committee (PNFHPC)
- In-River Agreements: State, Federal, and Tribal representatives
- Northwest Power Planning Council Sub Basin Plans
- Washington Department of Fish and Wildlife Wild Salmonid Policy

3.3 Relationship to harvest objectives.

Ringold steelhead returns are harvested from the Lower Columbia up to Priest Rapids Dam. A small number might migrate up to Wells Dam and is available in the upper Columbia steelhead fishery when that fishery exists. The targeted fishery is in the mainstem adjacent to the Ringold Springs Hatchery area where imprinted fish home to the Spring Creek outlet. A significant bank and boat fishery targets the AD/RV mass marked fish when they return. When Upper Columbia steelhead management goals for ESU escapement are met, Ringold steelhead above Priest Rapids can be harvested along with hatchery releases from the upper tributaries. Since 1981, the area from Priest Rapids downstream to the 395 Bridge has averaged approximately 2,187 sport caught steelhead annually. Additionally:

- Fisheries in the Columbia River basin were managed subject to provisions of the Columbia River Fish Management Plan (CRFMP) from 1988 through 1998. The CRFMP was a stipulated agreement adopted by the Federal Court under the continuing jurisdiction of U.S. v Oregon.
- NMFS has provided consultation under section 7 of the ESA on proposed fisheries in the Columbia basin since 1992 when affected salmonids were first listed. The Technical Advisory Committee (TAC) of U.S. v Oregon routinely prepared biological assessments for proposed fisheries that were submitted to NMFS through the U.S. Fish and Wildlife Service (USFWS).
- Section 7 Consultation - Annual Biological Opinion on Impacts of Treaty Indian and Non-Indian Fall Season Fisheries in the Columbia River Basin in Year 2004, on Salmon and Steelhead Listed Under the Endangered Species Act.
- Intentional take for Wells steelhead released from Ringold are covered under the

Biological Opinion section 7 of the ESA of 1973, and Direct Take Section 10 Permit 1395. 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).

- Incidental harvest of listed Upper Columbia steelhead during spring and fall Chinook fisheries is covered under section 7 #1248 currently under renewal.

3.4 Relationship to habitat protection and recovery strategies.

The Hanford/Columbia River reach is managed at a much larger scale than the subbasin or province, and within the subbasin and province most of the fisheries management and habitat protection is guided through existing legal agreements such as:

Habitat Conservation Plan (HCP) - Operation, monitoring and evaluation of these programs is proposed through the Chelan and Douglas Counties PUD re-licensing HCP that started with the "Biological Assessment and Management Plan Mid-Columbia River Hatchery Program (1998)".

ESA – Permits allow direct, indirect take and incidental takes.

FERC – Federal Action Agencies summer spill at Ice harbor and several Columbia Federal dams.

Subbaisn and Recovery Planning includes:
Mid-Columbia River Sub-Basin Plans (Bonneville Dam to Priest Rapids Dam) - Salmon and Steelhead Production Plan (September 1, 1990)

Upper Mid-Columbia Mainstem Subbasin Planning and the Upper Columbia Salmon Recovery Board. The County is a partner with Okanogan County , Chelan County , the Colville Tribes and the Yakama Nation. The mission of the *Upper Columbia Salmon Recovery Board* 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 River region. The organization intends to approach salmon recovery efforts in a transparent and evolving process to restore fish populations for ecosystems and people

Recent Habitat Conservation Plans:
The various state and federal fisheries agencies, including; NOAA Fisheries, United States Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW), three Native American tribes, the Chelan and Douglas Public Utility Districts, and an environmental organization, American Rivers, developed Hydro Power Habitat Conservation Plans (HCPs) for anadromous salmon and steelhead. Chelan PUD developed plans for the Rocky Reach and Rock Island Hydro Projects (Chelan PUD 2002a, 2002b). Douglas PUD (2002) developed a plan for the Wells Hydro Project. The plans commit the two utilities to a 50-year program to ensure that their hydro projects have no net impact on mid-Columbia salmon and steelhead runs. This will be accomplished through a combination of fish bypass systems, spill at the hydro projects, off-site hatchery programs and evaluations, and habitat restoration work conducted in mid-Columbia tributary streams. In addition to monitoring spawning activity (Initiation of Spawning, End of Spawning, Critical Elevation), The Washington Department of Fish and Wildlife (WDFW) has worked in cooperation with the Bonneville Power Administration (BPA), Grant County Public Utility District (GCPUD), Pacific Northwest National Laboratory (PNNL), Columbia River Inter-Tribal Fish Commission (CRITFC), Alaskan Fisheries, United States Fish and Wildlife Service (USFWS), and the Yakama Indian Nation to perform monitoring and impact analysis of flow fluctuations on emerging and rearing fall chinook in the Hanford Reach during the past seven years (1998-2004). The objectives of the evaluations were to: determine start and end

dates for implementation of the juvenile fall chinook salmon protection operations; determine factors affecting susceptibility of fall chinook fry to entrapment and stranding; estimate the number of juvenile fall chinook salmon stranded (mortalities) and entrapped in isolated pools (at risk) due to reductions in discharge from Priest Rapids Dam; and to evaluate the effectiveness of operational guidelines developed in the Interim Protection Plan on reducing mortality of fall chinook in the Hanford Reach.

The plans have been signed by NOAA Fisheries, USFWS, WDFW, the Confederated Tribes of the Colville Reservation and the PUDs, and have undergone regulatory review by NOAA Fisheries. The Section 10 permits issued by NOAA Fisheries will provide for the continued operation of the Wells, Rocky Reach, and Rock Island hydro projects and PUD-funded fish hatcheries, even though they may incidentally impact ESA listed spring chinook salmon and steelhead. Without those permits, operation of the hydro projects and hatcheries could be drastically altered.

3.5 Ecological interactions.

(1) *Salmonid and non-salmonid fishes or species that could negatively impact the program*: Ringold steelhead smolts can be preyed upon through the entire migration corridor from release to the mainstem Columbia River estuary. Northern pikeminnows and introduced spiny rays along the Columbia mainstem sloughs can predate on chinook smolts as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons. Based on PIT tags recovered at a large Caspian Tern nesting colony on Rice Island, a dredge material disposal island in the Columbia river estuary, 6-25 million of the estimated 100 million out-migrating juvenile salmonids from the Columbia reaching the estuary were consumed by the terns in 1997 (Roby, et al. 1997). River otters (*Lutra canadensis*) are present in the lower Columbia region and may represent a substantial predation source on juvenile salmonids. Harbor seals (*Phoca vitulina*), Steller sea lions (*Eumetopias jubatus*), and California sea lions (*Zalophus californianus*) are commonly observed in the Columbia River estuary. Seals and sea lions reportedly prey on adult salmonids, although diet studies indicate that other fish species generally comprise the majority of their food. These mammals are often attracted to concentrated fishing effort and can be troublesome to both sport and commercial fishers by taking hooked or net-caught fish before they can be landed. Additionally, other hatchery fish may be a source of competition for Bonneville URB fall chinook.

(2) Salmonid and non-salmonid fishes or species that could be negatively impacted by the program: Co-occurring natural salmon and steelhead populations in local tributary areas and the Columbia River mainstem corridor areas could be negatively impacted by program fish. Of primary concern are the ESA listed endangered and threatened salmonids: Snake River fall-run Chinook salmon ESU (threatened); Snake River spring/summer-run Chinook salmon ESU (threatened); Lower Columbia River Chinook salmon ESU (threatened); Upper Columbia River spring-run Chinook salmon ESU (endangered); Columbia River chum salmon ESU (threatened); Snake River sockeye salmon ESU (endangered); Upper Columbia River steelhead ESU (endangered); Snake River Basin steelhead ESU (threatened); Lower Columbia River steelhead ESU (threatened); Middle Columbia River steelhead ESU (threatened); and the Columbia River distinct population segment of bull trout (threatened). The potential exists for large-scale hatchery releases of fry and fingerling ocean-type chinook salmon to overwhelm the production capacity of estuaries (Lichatowich and McIntyre 1987). Estuaries may be “overgrazed” when large numbers of ocean-type juveniles enter the estuary en masse (Reimers 1973, Healey 1991). Listed fish can be impacted through a complex web of short and long term processes and over multiple time periods which makes evaluation of this a net effect difficult. WDFW is unaware of studies directly evaluating adverse ecological effects to listed salmon. See also Section 2.2.3 Predation and Competition.

3) Salmonid and non-salmonid fishes or other species that could positively impact the program. Returning chinook and other salmonid species that naturally spawn in the target stream and surrounding production areas may positively impact program fish. Decaying carcasses may contribute nutrients that increase productivity of the overall system. There are no species that are known to directly positively impact the program. Multiple hatchery programs salmonid releases into the Columbia river system, along with listed species (section 2), benefit the program by providing additional predation opportunity in the Columbia mainstem and estuary. Numerous non-salmonid fishes sculpins, lampreys and sucker etc. also would provide the same indirect benefits.

4) Salmonid and non-salmonid fishes or species that could be positively impacted by the program. A host of freshwater and marine species that depend on salmonids as a nutrient and food base may be positively impacted by program fish. The hatchery program may be filling an ecological niche in the freshwater and marine ecosystem. A large number of species are known to utilize juvenile and adult salmon as a nutrient and food base (Groot and Margolis 1991; and McNeil and Himsworth 1980). Wild co-occurring salmonid populations might be benefited as hatchery fish migrate through an area. The migrating hatchery fish may overwhelm predator populations, providing a protective effect to the co-occurring wild populations. Pacific salmon carcasses are also important for nutrient input back to freshwater streams (Cederholm et al. 1999). Successful or non-successfully spawner adults originating from this program may provide a source of nutrients in oligotrohic coastal river systems and stimulate stream productivity. Carcasses from returning adult salmonids have been found to elevate stream productivity through several pathways, including: 1) the releases of nutrients from decaying carcasses has been observed to stimulate primary productivity (Wipfli et al. 1998); 2) the decaying carcasses have been found to enrich the food base of aquatic invertebrates (Mathisen et al. 1988); and 3) juvenile salmonids have been observed to feed directly on the carcasses (Bilby et al. 1996).

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.

Water is supplied by springs located east of the facility and provide water which is a fairly constant temperature of 60 F° and flows to an intake box. The facility has total water rights of 69.2 cfs. Temperatures in the rearing receptacles though, can range from 52°F - 62°F over the year. Up to 55 cfs is gravity fed to the rearing vessels via a 4,700 linear foot polyethylene pipeline 42'in diameter. Water rights total 26,929 gallons per minute (gpm) from springs with an average use of about 1,400 gpm into a 5.0 acre rearing pond. Up to 10,000 gpm (22 cfs) is used for the nine-acre pond. There is a total of 14 8'x 80' vinyl raceways that can use up 1920 gpm (4.3 cfs) each. During subyearling rearing fish are populated in up to ten vinyl raceways. By mid-winter fish are transferred to the 5-acre pond which is spring fed. Outflow from the rearing ponds join un-used spring water to create Spring Creek.

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.

Table 2. Summary of risk aversion measures for the Ringold summer steelhead program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.2	Water rights are formalized through trust water right S3-283301 and S3-27816 from the Department of Ecology. Monitoring and measurement of water usage is reported in monthly NPDES reports.
Intake Screening	4.2	The Ringold Springs water supply does not have listed fish in the system.
Effluent Discharge	4.2	This facility operates and complies with limits under the "Upland Fin-Fish Hatching and Rearing" National pollution Discharge Elimination System (NPDES) administered by the Washington Department of Ecology (DOE) - WAG 13-7009 and IHOT 1995 which act to protect the quality of receiving waters adjacent to the hatchery. Dilution factors downstream of hatchery effluent discharge points will lead to further diminishment of already insignificant effects of hatchery effluent from the above facilities on mainstem habitat quality affecting listed salmon and steelhead. The Ringold Springs hatchery facilities discharge effluent directly to the Columbia River. This facility meets or exceeds NPDES requirements. Total instantaneous discharge for the facilities are up to 69 cfs. Hatchery effluent from the facilities located on the mainstem Columbia is greatly diluted and will have insignificant effects on outmigrating listed species and their habitat.

Section 5. Facilities

5.1 Broodstock collection facilities (or methods).

Wells Dam/Hatchery:
Broodstock for the Ringold summer steelhead program is collected using a trap/weir in the West Bank Fish Ladder at Wells Dam. In some years, staff would need to collect adults from the volunteer raceway, which is located below the rearing and adult holding ponds.

Ringold Springs:
Ringold Springs does not actively trap adults for broodstock, although summer steelhead can be trapped during the season along with spring or fall chinook salmon. Adults access the trap by moving up Spring Creek and through a picket weir (with V notch) into the Spring Creek trapping channel. An upstream picket weir contains adults. Adults are seined, collected, discriminated for biometric information (e.g. marks, CWT/PIT tags), and can be loaded and transported to off station release sites downriver (Ringold marked fish), or upriver of Ringold Springs (Upper Columbia Region marked fish). Ringold origin fish can be taken to landlocked lakes for additional sport harvest opportunities or donated to local food banks.

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

Adult steelhead can be moved back to the mainstem or to landlocked lakes for additional harvest opportunity. Below is the equipment used for hauling adults from Ringold or for bringing the juveniles from Klickitat Hatchery.

Equip. Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)
Tanker Truck- Adult Transfer (Upriver)	800	Y	N	15
Tanker Truck- Juvenile Transfer (Klickitat Hatchery to Ringold	1500	Y	N	180

5.4 Incubation facilities.

Eggs are eyed at Wells Hatchery and transferred to Klickitat Hatchery. Heath trays are used at Wells and FALs are used at Klickitat.

Incubator Type	Units (number)	Flow (gpm)	Loading-Eyeing (eggs/unit)	Loading-Hatching (eggs/unit)
Heath Tray	728	na	8,000	8,000
FAL- Klickitat Hatchery	20	20	10,000	10,000

5.5 Rearing facilities.

Steelhead fry are ponded at Klickitat Hatchery in raceways. When fish reach 100 fpp, they are transferred to Ringold Springs. At Ringold, they are reared in 10 vinyl raceways during early rearing and then are marked and moved to a 5.0 acre pond. Each system is independently plumbed for water from the mainline from the springs.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Flow Index	Max. Density Index
14	Vinyl Raceways	1660	83	8	3.5	373	0.4	0.1
1	Earthen Pond (5.0 acres)	1673000	-	-	8.0	1,400	-	-

5.6 Acclimation/release facilities.

Program is released from the 5-acre earthen pond. Fish have been acclimated on station at Ringold Springs from late summer until mid-April (approximately six months).

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

In past years, a 40% loss of fish occurs during the period between ponding and the first inventory (at tagging). Losses to predation and other unknown means approached 60% in 1999 and 2000. It is unknown what the causes were, as outlet screens and predation (nets) structures were thoroughly inspected and found to be intact. Heavy losses can be attributed to bird predation in the 5-acre pond. Budgets and funding have limited the amount of netting for preventing bird predation at this facility.

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

Potential Hazard	Risk Aversion Measure
Equipment failure/Water loss	Staff is available 24/7 to respond to these hazards. Aeration pumps are used to maximize the water conditions in the adult collection pond during periods of low water quality, which benefits fish held until sorting can be accomplished.
Disease Transmission	Fish Health guidelines on release are followed on rearing and release (IHOT 1999).

Section 6. Broodstock Origin and Identity

6.1 Source.

Adult broodstock are collected at Wells Hatchery at Wells Dam.

6.2.1 History.

Since 1963, steelhead have been released from Ringold Springs (former Washington Game Department facility). Until the merger into WDFW in 1996, the brood source was mostly Skamania stock summer steelhead except years in the early 1980's when IHN problems at Skamania required some Wells stock to be used. Alternate hatchery brood sources used for some portion of this program have been Yakima and Chelan faculties. In recent years, the program used returns captured at Ringold Springs Hatchery for holding and spawning with eggs being transferred to Lyons Ferry for incubation, hatching and early rearing or to supplemented needs for Skamania Hatchery. With UCR steelhead listings in 1997, the program changed to Wells Hatchery stock. (1998).

Broodstock Source	Origin	Year(s) Used	
		Begin	End
Skamania Hatchery Summer Steelhead Stock	H	1963	1997
Wells Hatchery Stock	H	1981	1983
Wells Hatchery Stock	H	1998	Present

6.2.2 Annual size.

In recent years, the adult run return past Wells Dam ranges from 1472 (1993) to 27734 (1981). The trends from 2000-2004 have been increasing with average returns approaching 18,000 fish (WDFW Historical data base). Take permits allow 373 adults yearly (2.07%) available for propagation purposes.

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

The intent of the Ringold (Wells) program is H x H crosses. At Wells Hatchery, a mix of crosses is used depending on the final planting location of the program fish (different upper Columbia tributaries).

Steelhead broodstock for the Wells Hatchery stock program are collected in the west ladder of Wells Dam and from volunteer returns to the Hatchery. Fish are collected from throughout the run starting in August and into the following spring. To supply sufficient steelhead for all subbasins in the upper Columbia, up to 420 steelhead are collected for broodstock. Wild-origin fish have made up 5-12% of the broodstock. Fish are spawned in the spring as they ripen. Steelhead matings for the program are Wild x Wild (W x W), Hatchery x Wild (H x W), and H x H, with the latter destined for the Okanogan subbasin and Ringold Springs. The intent for the Ringold program is for early ripening steelhead H x H crosses, although early ripening H x W crosses could be considered. Current steelhead populations originated from a mix of indigenous upper Columbia Basin stocks intercepted during the 1930s and 1940s, including potentially resident rainbow trout populations. The Wells Hatchery stock was initiated in the 1960s from naturally spawning populations migrating past Priest Rapids Dam. The genetic background of the stock is therefore from a mix of populations. The stock is considered highly domesticated from years of broodstock collection at the hatchery and the low level of natural-origin fish available for inclusion in the broodstock. With about 81% of the natural spawning escapement consisting of hatchery-origin fish and the Okanogan subbasin receiving progeny of H x H

crosses, the natural populations have been substantially affected by the Wells Hatchery program. The new conservation programs initiated by the Colville Tribes and further efforts by WDFW at the hatchery to incorporate different matings (H x W, etc.) are intended to improve the viability and adaptability of steelhead in the Okanogan (and other) subbasin. Hatchery returns continue to dominate the run over Wells Dam. The average percent of wild origin dropped to 9% for 1996-2001 compared to 19% for the period prior to the previous status review (NMFS 2003b). The average percent of wild origin in the 2002 and 2003 runs were 19% and 10% respectively (pers. comm. K. Truscott, WDFW 2002, 2004).

6.2.4 Genetic or ecological differences.

The Ringold fish are considered to be an "ESU-reserve stock" if catastrophic loss in the upper Columbia jeopardizes the population. They are progeny of upper Columbia stock although the spawner cohorts are primarily H x H crosses.

The Wells Hatchery steelhead stock is considered essential for recovery, and is included in the listing. The Wells hatchery stock is considered part of the UCR ESU because it was founded from a mixture of native populations and retains genetic resources of steelhead populations above Grand Coulee Dam that are now extinct. 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.

6.2.5 Reasons for choosing.

The switch from Skamania stock to locally adapted Wells stock was done in response to ESA impact on UCR listed steelhead.

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

- In an effort to separate this program from the wild component in the upper Columbia, WDFW transfers offspring from the earliest spawned Wells hatchery fish downstream to Ringold Hatchery via Klickitat Hatchery.
- Broodstock origin are Wells summer steelhead which are trapped at the Wells Dam west ladder. Adult collection at the dam occurs 3 days a week and only 16 hours of the day. Sampling would occur 16 to 32 hours per week during the migration period in order to achieve a minimum sample rate equal to 10 percent of the run.
- Egg collection at Wells for Upper Columbia River programs (Methow) can be identified by a number of representative mark including visual implant (VIE) and passive integrated transponder (PIT) tags.
- Returning Ringold Springs summer steelhead are selectively excluded from the bloodstock collection and can be identified by an AD/RV mark. Some early ripening H x W crosses could be used some years though.

Section 7. Broodstock Collection

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

Adult steelhead are collected at the Wells Dam fish ladder an trapping facility.

7.2 Collection or sampling design

Broodstock cohorts are collected from adults that are trapped at Wells Dam and are held at Wells Hatchery. Only a portion of the upper Columbia River steelhead are impacted as trapping is limited to 3 days weekly per Section 10 permit. Wells steelhead spawning protocols involve both H x W and H x H matings with adults collected across the run. Ringold origin steelhead adults that enter Wells Trap can be identified by a right ventral fin clip and are not used in the spawning protocol. These fish can be passed upstream.

For the Ringold program, eggs from the earliest spawned fish are used and mating intent is H x H crosses. Wild crosses from the early component are not intentionally used in the Ringold portion. Wild crosses are identified for upper Columbia ESU use, after scale analysis confirmation has been received. In addition to the collection and sorting design during the trapping at Wells, staff can also collect adults from the volunteer raceway which is located below the Wells rearing and adult holding ponds.

Staff monitors the trapping at the Wells Dam west ladder trap, starting in August. Representative portions of the run are collected for broodstock and tracked for the bi-weekly broodstock collection protocol. Ratios of females and males are tracked with females usually making up at least 60% of the total run and the total percent of spawners on hand. Age composition is tracked to estimate fecundity and egg potential of the population with 2-salt fish normally outnumbering 1- salt spawners 9 to 1 (Truscott 2004).

7.3 Identity.

The Wells Hatchery steelhead stock is considered essential for recovery, and is included in the listing. The Wells hatchery stock is considered part of the UCR ESU because it was founded from a mixture of native populations and retains genetic resources of steelhead populations above Grand Coulee Dam that are now extinct. Wells Hatchery steelhead are used for the Ringold program to provide harvest and reduce genetic impacts to the UCR ESU. Adults are held on well water with the early segment at Wells Hatchery spawning in December, with the later component continuing until March. Wild spawning in stream occurs in April and May. Marking techniques identify spawner origins (Hatchery or Wild) with up to 10% wild fish integrated within the program.

7.4 Proposed number to be collected:

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

Approximately 45 pair of spawners depending on fecundity are needed for the Ringold portion.

7.4.2 Broodstock collection levels for the last twelve years (e.g. 1990-2001), or for most recent years available. Below are number of spawners used for the Wells program. The first adults spawned for eggs used in the Ringold program began in 1997.

YEAR	Male	Female	TOTAL
1995	240	245	485
1996	221	288	509
1997	303	279	582
1998	174	256	430
1999	182	225	407
2000	173	206	379
2001	161	173	334
2002	176	206	382
2003	126	170	296
2004	225	167	392

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

At Wells: All listed steelhead not used for propagation or studies are released to the Upper Columbia.

At Ringold: WDFW removes hatchery origin steelhead captured in the Ringold Springs ladder/trap that are not needed for reserve. Hatchery fish identified by AD and RV clips are re-cycled back to Pasco (downstream of release site) for additional sport opportunity or are taken to area landlocked ponds and lakes.

7.6 Fish transportation and holding methods.

Up to 1997 with Skamania stock, steelhead returning to Ringold could be collected and hauled as broodstock. Since the program now originates at Wells, steelhead from Ringold have not been needed. A tanker is available for harvest recycling.

Equipment Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Tanker Truck- Adult Transfer (Upriver)	800	Y	N	15		

7.7 Describe fish health maintenance and sanitation procedures applied.

Monthly fish health inspections occur at Wells. Because of very low numbers of adults held in broodstock raceways, raceway cleaning is unnecessary. Treatments for fungal infections are applied with chemical flushes made through the raceways.

7.8 Disposition of carcasses.

Integrated Hatchery Operations Team (IHOT), Pacific Northwest Fish Health Protection committee (PNFHPC), state* or tribal guidelines are followed for broodstock fish health inspection, transfer of eggs or adults and broodstock holding and disposal of carcasses. At Wells, carcasses can be used downstream for nutrient enhancement.

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.

Wells Broodstock Collection Program:

- Broodstock will be collected from throughout the natural run period to provide for random selection of adults from the entire adult population, prevent run timing divergence of the hatchery reared population from the natural population, and provide for natural fish escapement into the habitat to spawn.
- If both east and west ladder traps are utilized, they would operate concurrently not to exceed 16 hours per day. Adult collection at the dam occurs 3 days a week. Sampling would occur 16 to 32 hours per week during the migration period in order to achieve a minimum sample rate equal to 10 percent of the run.
- Returning adults from natural brood smolt releases will be allowed to enter the spawning population as well as being integrated for the hatchery supplementation programs.
- Egg collection at Wells for Upper Columbia River programs (Methow) can be identified by a number of representative makers including visual implant (VIE) and passive integrated transponder (PIT) tags.
- Returning Ringold Springs summer steelhead are excluded from the broodstock collection and can be identified by an AD/RV mark. If needed, Ringold fish could be used as a reserve stock if needed for the UCR ESU.
- Fish are pooled and egg selection from earlier timed fish are destined for the Ringold program
- Disease control efforts (in accordance with PNWFHC and IHOT standards) will effectively control expansion of species specific or general salmonid diseases.

Fish returning to Ringold Springs Trap:

- Wild steelhead identified with adipose fin, AD clip only, or VIE/PIT tags indicating UCR steelhead programs are transported and released into the Columbia mainstem approximately 4 miles upstream of the Ringold Springs area.

Section 8. Mating

8.1 Selection method.

At Wells, mating selection and permit protocols involving brood origin and early timed fish are implemented by staff. Initially, fish are discriminated for their origin (natural versus hatchery) in order to implement selective mating of W x H and H x H crosses. H x H matings are used in the Ringold Summer Steelhead Program.

8.2 Males.

Few jacks return in the spawning population, and are not used in spawning protocol. In cases of limited males to female ratio, males will be reused.

8.3 Fertilization.

Wells steelhead return at approximately a 60:40 females to male ratio. At Wells Hatchery, gametes are not pooled prior to fertilization but spawned 1:1 and isolated incubated. Males will be used for more than one female if needed.

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.

- Crosses of H x H, H x W portions are documented for the various programs at Wells.
- 60 ovarian fluid samples are taken for detection of infectious hematopoietic necrosis virus (IHNV).
- 100% organ samples are collected for detection of infectious pancreatic necrosis virus (IPN).
- Eggs are isolated during incubation (IPN).

Section 9. Incubation and Rearing.

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

Year	Egg Take	Green-Eyed Survival (%)	Eyed-Ponding Survival (%)	Fingerling-Smolt Survival (%)
1995	1,806,500	84.3	~99.0	78.0
1996	1,526,600	82.3	~99.0	74.0
1997	1,090,000	89.9	~99.0	93.0
1998	1,719,548	85.8	~99.0	96.0
1999	1,392,098	75.7	~99.0	92.0
2000	1,148,999	84.6	~99.0	65.0
2001	987,634	86.22	~99.0	57.0
2002	1,277,545	84.8	99.0	73.4
2003	1,069,631	82.6	83.5	63.6
2004	-	-	-	-

9.1.2 Cause for, and disposition of surplus egg takes.

Section 10 Direct Take Permit 1395 - limits the take of steelhead and eggs at Wells. The permit also allows that circumstances, such as unanticipated, higher-than-expected fecundity, or high egg-to-fry survival rates, lead to the inadvertent possession of steelhead substantially in excess (>110 %) of program production levels specified above, then surplus eggs or fish shall be culled from the population in a manner consistent with achieving program goals. The permit limits production at Ringold Springs to 180,000 fish, therefore based on green egg to smolt loss, 200,000 eyed eggs are transferred to Klickitat Hatchery.

9.1.3 Loading densities applied during incubation.

Steelhead eggs range in size from 2,800 eggs/lb to 3,000 eggs/lb. Standard loading of eyed eggs per shallow trough basket is 20,000. Trough flow is varied from 8 to 12 gallons per minute (gpm) depending on the stage of the egg or fry.

9.1.4 Incubation conditions.

Egg incubation occurs at Wells (fertilized to eyed) and Klickitat (eyed to hatch) Hatcheries. Heath trays are used at Wells and FALs are used at Klickitat. Standard low-level alarms are present in the hatchery and water temperatures are recorded using Tidbit temperature loggers. Silt management is usually not necessary and influent and effluent gas concentrations, including dissolved oxygen, are within optimal parameters for salmonid egg and juvenile survival. Water temperatures are monitored continuously with a thermograph and recorded while temperature units (TU) are tracked for embryonic development. Although water is saturated with oxygen at 12 ppm, dissolved oxygen content is monitored and has been at acceptable levels (minimum criteria of 8 parts per million (ppm)). When using artificial substrate, vexar or bio-rings, egg densities within incubation units are reduced by 10%. Disinfection procedures are implemented

during incubation that prevents pathogen transmission between stocks of fish on site.

9.1.5 Ponding.

Steelhead are ponded at Klickitat Hatchery from the stack incubators to starter raceways in the incubation building. The procedures used for determining when fry are ponded include removing fry from incubation units when 80-90% of observed fry have yolk-sac material that is 80-90% utilized and contained within body cavity ("button-up") and are ponded when based on visual inspection of the amount of yolk remaining. After indoor intermediate raceways, they are moved to outside raceways after all fish are free swimming and are feeding well.

In some years, Wells Hatchery can provide fingerlings that were initially ponded at Wells to Klickitat Hatchery.

9.1.6 Fish health maintenance and monitoring.

At Wells and Klickitat Hatcheries, eggs are examined daily by hatchery personnel. Prophylactic treatment of eggs for the control of fungus is prescribed by a WDFW fish health specialist, and may include treatment with formalin or other accepted fungicides. Non-viable eggs and sac-fry are removed by bulb-syringe.

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

Eggs are incubated in pathogen free, silt free well water to ensure maximum egg survival and minimize potential loss from disease. The hatchery incubation room is protected by a separate low water alarm system and an automatic water reuse pumping system, and for the use of wells separate from the hatchery's main well field.

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. Data below is provided by Wells Hatchery

Year	Egg Take	Green-Eyed Survival (%)	Eyed-Ponding Survival (%)	Fingerling-Smolt Survival (%)
1995	1,806,500	84.3	~99.0	78.0
1996	1,526,600	82.3	~99.0	74.0
1997	1,090,000	89.9	~99.0	93.0
1998	1,719,548	85.8	~99.0	96.0
1999	1,392,098	75.7	~99.0	92.0
2000	1,148,999	84.6	~99.0	65.0
2001	987,634	86.22	~99.0	57.0
2002	1,277,545	84.8	99.0	73.4
2003	1,069,631	82.6	83.5	63.6
2004	-	-	-	-

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

At Klickitat Hatchery, standard raceway rearing density criteria for steelhead should not exceed 0.26 lbs fish/ft3. Once at Ringold Springs, they are reared up to 0.33 lbs fish/ft3 (25 fpp) in the vinyl ponds, before being transferred to the 5.0-acre rearing pond. Densities in the 5.0-acre do not exceed 0.25 lbs fish/ft3 at release.

9.2.3 Fish rearing conditions.

Fish are ponded and started at Klickitat Hatchery in raceways and are reared until late summer to fall when fish are approximately 100 fpp and then transferred to Ringold Springs Hatchery.

Once at Ringold, they are placed in up to 10 vinyl raceways supplied with water from the hatchery's spring fed intake. Approximately 373 gpm water enters each raceway. Oxygen levels range between 10-12 ppm coming in to 8-10 ppm leaving the raceway, depending on ambient air temperature and number of fish in the raceway. Raceways are cleaned times weekly by brushing to remove accumulated uneaten feed and fecal material. Feeding is by pneumatic presentation from timed feeders, or by hand presentation. Dissolved oxygen, temperature and pH levels are monitored. Vinyl raceways have predator netting over the ponds.

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.

Data below includes startup rearing for Wells steelhead at Wells Hatchery only.

Rearing Period	Length (mm)	Weight (grams)	Condition Factor
April	48	1.07	0.97
May	54	1.47	0.93
June	67	2.83	0.94
July	78	4.49	0.95
August	93	7.56	0.90
September	100	9.86	0.99
October	113	13.7	0.95
November	130	21.6	0.98
December	144	28.4	0.95
January	169	45.36	0.94
February	184	59.68	0.96
March	215	92.57	0.93
April	233	113.0	0.93

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

Data below includes startup rearing for Wells steelhead at Wells Hatchery only.

Rearing Period	Length (mm)	Weight (grams)	Condition Factor
April	48	1.07	0.97
May	54	1.47	0.93
June	67	2.83	0.94
July	78	4.49	0.95
August	93	7.56	0.90
September	100	9.86	0.99
October	113	13.7	0.95
November	130	21.6	0.98
December	144	28.4	0.95
January	169	45.36	0.94
February	184	59.68	0.96
March	215	92.57	0.93
April	233	113.0	0.93

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

Fry/fingerling will be fed an appropriate commercial dry or semi-moist trout/salmon diet and can be switched to a dry diet as they approach yearling stage. Early stage feeding occurs several times daily as necessary to provide the diet at a range of 0.7 – 1.1% B.W./ day. Feed conversion is expected to fall in a range of 1.1 – 1.4 pounds fed to pounds produced. Due to the duration of spawning time from the natural steelhead, a variety of starter diets and feeds schedules may be used to achieve a similar size among the fish before they are moved outside to the rearing raceways. This strategy will reduce the variation (CV's) in size of juveniles within the supplemented population. As larger fish, feeding intervals and rate are reduced.

Rearing Period	Food Type	Application Schedule (#feedings/day)	Feeding Rate Range (%B.W./day)	Lbs. Fed Per gpm of Inflow	Food Conversion During Period
April	Moore Clark Nutra #1	6	2.25-3.0	-	0.8
May July	Moore Clark Nutra #2	6	1.75-2.25	-	0.8
Aug-Nov	Moore Clark Nutra #3	4	1.5-1.75	-	0.8
Dec-Feb	Moore Clark 3/32	2	0.75-1.5	-	0.8
Feb-April	Rangen 1/8	1-2	0.5-1.2	-	0.8

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

Monitoring	A fish health specialist inspects fish monthly at Ringold Hatchery and checks both healthy and, if present, symptomatic fish. Based on pathological or visual signs by the crew, age of fish and the history of the facility, the pathologist determines the appropriate tests. External signs such as lesions, discolorations, and fungal growths will lead to internal examinations of skin, gills and organs. Kidney and spleen are checked for bacterial kidney disease (BKD). Blood is checked for signs of anemia or other pathogens. Additional tests for virus or parasites are done if warranted.
Disease Treatment	Bacterial Coldwater Disease (BCD also called Flavobacteriosis) at the early rearing stages at Klickitat Hatchery has been treated with Terramycin (4.0gm/lb). As broodstock, all Wells spawners are 100 % viral sampled. Little IHN problems have been encountered in this program.
Sanitation	All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy). All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots. Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water. Tank trucks are disinfected between the hauling of adult and juvenile fish. Footbaths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

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

The migratory state of the release population is determined by volitional release, behavior, physical appearance, and other criteria. During the late spring, the quantity of flow from the springs may dictate release of the fish if spring flow is low. Staff takes monthly weight samples along with length frequency measurements and calculates coefficient of variation (CV) to determine smolt development as per Steelhead Rearing Guidelines (WDFW July 2001). Program goal for the program will be to release fish between April 1-30 at 4.5 fish/lb approximately 220 mm fl. Pre-liberation samples note smolt development visually based on degree of silvering, presence/ absence of parr marks, fin clarity and banding of the caudal fin.

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

Natural rearing methods are not applied. However, the 5.0 acre earthen pond give the program interaction to some natural food sources, e.g. aquatic insects, and sometimes exposure to avian predation.

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.

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

- Conduct routine water monitoring to ensure that the levels of total suspended solids, settle-able solids, and water temperature at each facility to remain compliant with NPDES permits issued by Washington Department of Ecology;
- Follow fish disease control guidelines developed by IHOT (1995) and the PNFHPC (1989) to reduce the incidence of fish diseases;
- Conduct routine, generally monthly, fish growth monitoring during rearing at each facility;
- Dispose of juvenile mortality via the local solid waste management system, or on-station burial.

Section 10. Release

10.1 Proposed fish release levels.

Up to 180,000 smolts. This is a maximum level. Available eggs from Wells program are for the UCR ESU supplementation programs with Ringold Springs a lower priority.

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

Age Class	Goal	Size (ffp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Water-shed	Eco-province
Yearling	180,000	4.5 – 5.0	April-May	Spring Creek/ Tributary to Columbia River (RKm 567)	567	Upper-Middle Columbia River	Columbia Plateau

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

	Yearling Release		
Release Year	No.	Date (MM/DD)	Avg Size (fpp)
1996	167,548	April 15-30	4.4
1997	157,896	April 15-30	4.3
1998	200,000	April 15-18	4.3
1999	181,000	April 17-26	5.7
2000	181,000	April 3-7	5.2
2001	210,000	April 1-18	4.2
2002	164,556	April 10-17	4.3
2003	171,645	April 11-22	4.0
2004	106,147	April 12-18	5.3

10.4 Actual dates of release and description of release protocols.

A volitional release is planned for mid-April. Actual dates of release are in section 10.3 (see above). Screens are removed from the 5.0-acre rearing pond and most smolts ready to go can drop over the stop-log structure immediately. A majority of the population initially vacates the pond quickly according to staff. During the next 2-3 days, the pond is lowered slowly to stimulate and encourage movement to Spring Creek. Once in Spring Creek, fish move rapidly and enter the Columbia mainstem.

10.5 Fish transportation procedures, if applicable.

Fish are released directly from the rearing pond on station and do not need transportation.

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

Fish are acclimated and volitionally released from Ringold Springs 5.0-acre rearing pond. Rearing has occurred for approximately six months on Ringold Springs water, to provide acclimation to the chemistry and temperature regime of Spring Creek as it enters the mainstem Columbia River.

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

Fish are 100% adipose and right ventral clipped. Adipose clip/RV mark is used to ensure that harvest of Ringold fish can continue, separate of Upper Columbia steelhead status. The ID also excludes Ringold fish from the broodstock selection at Wells Hatchery and monitors any Ringold fish passing upstream of Priest Rapids Dam.

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

Ringold steelhead production is capped by Section 10 permit levels. Also, depending on the amount of broodstock at Wells Hatchery, the Ringold program would be the lowest priority of using UCR steelhead for hatchery and supplementation. Programs in the Methow would take precedence over the Ringold program if needed.

10.9 Fish health certification procedures applied pre-release.

Fish transfers into the subbasin are inspected and accompanied by notifications as described in IHOT and PNFHPC guidelines. Prior to release, the population health and condition is established by the Area Fish Health Specialist at Ringold Hatchery. 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. Prior to this examine, whenever abnormal behavior or mortality is observed, staff also conducts the Area Fish Health Specialist. The fish specialist examines affected fish, and recommends the appropriate treatment. Reporting and control of selected fish pathogens are done in accordance with the PNFHPC disease control guidelines and IHOT guidelines.

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

Ringold Springs Hatchery outlet screens and boards to rearing systems would be pulled, and fish would be allowed to volitionally move out of facility. As the spring water is gravity fed, loss of water outside of screen plugging will not be a problem.

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.

- Release is capped at number that meets Section 10 permit guidelines for the UCR ESU.
- Rearing of hatchery salmon on parent river water, or acclimation of fish for several weeks to parent river water also will contribute to the smoltification process, and reduced hatchery salmon residence time in the rivers and mainstem migration corridors.
- Program release is consistent with WDFW Statewide Steelhead Rearing Guidelines (July 2001) for programs above Bonneville Dam indicating the time, size and conditional release of smolts for migration fitness and smoltification occurs within nearly the entire population, which reduces residence time in the streams after release (Bugert et al.1991).
- Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish.
- Volitional release practices are employed to foster the exodus of smolts from rearing ponds over extended periods to reflect normal migratory behavior patterns, while un-smolted fish remain in rearing ponds to continue to feed and develop.
- Volitional release practices also act to reduce instantaneous densities of hatchery-reared fish in wild fish production areas, reducing potentially adverse density-dependent effects.
- Releases can be timed with enhanced flow, spill, and fish passage actions coordinated through the Fish Passage Center and the various dam operators.
- Physiological measures, including allowable C.V. maximum of 10% (fork length), will be used to indicate when salmon should be allowed to enter the stream to maximize out-migration.
- Adherence to WDFW fish disease control policies will reduce the incidence of diseases in hatchery fish produced and released, further decreasing the likelihood for disease transfer to wild salmon and steelhead.
- Where large scale (non-volitional) mass smolt releases become necessary, those releases will also be timed with enhanced flow/spill/passage enhancement activities coordinated through the Fish Passage Center and the various dam operators. Timing of releases with water budget flow release schedules will further accelerate seaward migration of released salmon, further reducing the duration of any interactions with wild fish.

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.

Continue to monitor catch of selective steelhead from Ringold based on punch cards.
Continue to partner with available education opportunities in the area.
Continue Co-mgr communication and cooperation for UCR escapements needs during in-season forecasts and monitoring at Priest Rapids Dam.
Adhere to NMFS Section 10 Direct and Indirect permits.
Continue to mark AD clip and RV for selective identification.
Follow and adhere to IHOT and WDFW Fish Health protocols for adult broodstock, incubation, rearing and releases.

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

In order to comply with Section 10 permitting, WDFW Region Staff evaluation and needed monitoring is in place to allow implementation.

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.

Trapping, handling and rearing protocols as spelled out in Section 10 permits will be followed. Deviation or environmental conditions such as water temperatures will be communicated to NOAA staff for consultation.

Section 12. Research

12.1 Objective or purpose.

Downstream smolt passage will continue to be monitored at smolt collection and bypass facilities at hydroelectric facilities on the Columbia River, and at smolt traps operated by the WDFW Production Division on Columbia River tributaries, to identify migration overlaps between listed salmon and steelhead originating from the Upper Columbia, Lower Columbia, and Snake River Basin ESUs, and unlisted upper Columbia River hatchery-produced salmon. Data collected in on-going smolt out-migrant trapping operations on the systems will also be used to identify time periods when ecological interaction between wild steelhead and salmon and hatchery releases are likely. Hatchery performance will continue to be monitored on an annual basis through the IHOT process. Included in IHOT hatchery performance monitoring is the determination of the success of each operation in meeting wild salmonid impact reduction criteria (Appendix I - "Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.", IHOT 1996). Success in meeting smolt-only release, volitional release, and disease-free criteria will be among the factors monitored to gauge potential effects on listed salmon and steelhead.

12.2 Cooperating and funding agencies.

NA

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.

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

Bilby, R.E., B.R. Fransen, and P.A. Bisson. 1996. Incorporation of nitrogen and carbon from spawning coho salmon into the trophic system of small streams: evidence from stable isotopes. Can. J. Fish. Aquat. Scit. 53: 164-173.

Bugert, R., K. Petersen, G. Mendel, L. Ross, D. Milks, J. Dedloff, and M. Alexandersdottir. 1991. Lower Snake River Compensation Plan, Tucannon Spring Chinook Salmon Evaluation Program, report to U.S. Fish and Wildlife Service, Cooperative Agreement 14-16-0001-91534. Washington Department of Fisheries, Olympia, Washington.

Busby, P.J., T.C. Wainwright, G.J. Bryant, L. Lierheimer, R.S. Waples, F.W. Waknitz and I.V. Lagomarsino. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon and California. U.S. Department of Commerce, NOAA Tech. Memo. NMFS-NWFSC-27, 261 pp.

Dawley, E. M., R.D. Ledgerwood, T.H Blahm, R.A. Kirn, and A.E. Rankis. 1984. Migrational Characteristics And Survival Of Juvenile Salmonids entering the Columbia River estuary During 1983. Annual Report to the Bonneville Power Administration, Portland, OR.

Finstad, A.G., P.A. Jansen, and A. Langeland. 2001. Production and predation rates in a cannibalistic arctic char (*Salvelinus alpinus* L.) population. Ecol. Freshw. Fish. 10: 220-226.

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. 1999. UCR steelhead and spring chinook salmon population structure and biological requirements. National Marine Fisheries Service, Northwest Fisheries Science Center, Upper Columba River Steelhead and Spring Chinook Salmon Biological Requirements Committee, Draft Report, Seattle, Washington. November 23.

Harza. 1999. The 1997 and 1998 technical study reports, Cowlitz River Hydroelectric Project. Vol. 2, 35-42.

Healey, M. C. 1991. Life history of chinook salmon. Pages 311–394 in C. Groot and L. Margolis (eds.), Pacific salmon life histories. Vancouver, BC: University of British Columbia Press.

IHOT (Integrated Hatchery Operations Team), 1995. Operations Plans for Anadromous Fish Production Facilities in the Columbia River Basin. Volume III-Washington. Annual Report 1995. Bonneville Power Administration, Portland, Oregon. Project Number 92-043. 536 pp.

Lichatowich, J. and J.D. McIntyre. 1987. Use of Hatcheries in the Management of Anadromous Salmonids. American Fisheries Society Symposium 1:131-136.

Lower Columbia Fish Recovery Board (LCFRB). 2004. Lower Columbia salmon and steelhead recovery and sub-basin plan. Lower Columbia Fish Recovery Board, Washington state.

Mathisen, O.A., P.L. Parker, J.J. Goering, T.C. Kline, P.H. Poe, and R.S. Scalan. 1988. Recycling of marine elements transported into freshwater systems by anadromous salmon. Verh. Int. Ver. Limnol. 23: 2249-2258.

NMFS (National Marine Fisheries Service). 1999. Biological Opinion On Artificial Propagation in the Columbia River Basin. National Marine Fisheries Service, Northwest Region

Pearsons, T.N., G.A. McMichael, K.D. Ham, E.L. Bartrand, A. l. Fritts, and C. W. Hopley. 1998. Yakima River species interactions studies. Progress report 1995-1997 submitted to Bonneville Power Administration, Portland, Oregon. DOE/BP-64878-6.

Reimers, P .E. 1973. The length of residence of juvenile fall chinook salmon in the Sixes River, Oregon. Fish. Comrn. Ore. Res. Briefs. 4:1-43.

Roby, D. D., D. P. Craig, K. Collis, and S. L. Adamany. 1998. Avian predation on juvenile salmonids in the lower Columbia River. 1997 annual report to the Bonneville Power Administration and U.S. Army Corps of Engineers.

Seidel, Paul. 1983. Spawning Guidelines for Washington Department of Fish and Wildlife Hatcheries. Washington Department of Fish and Wildlife. Olympia, Wa.

SIWG (Species Interaction Work Group). 1984. Evaluation of potential species 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 Department of Fisheries. Olympia, WA. 80pp

Steward, C. 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.

USFWS (U.S. Fish and Wildlife Service). 1994. Biological assessment for operation of U.S. Fish and Wildlife Service operated or funded hatcheries in the Columbia River Basin in 1995-1998. Submitted to National Marine Fisheries Service (NMFS) under cover letter, dated August 2, 1994, from William F. Shake, Acting USFWS Regional Director, to Brian Brown, NMFS.

Washington Department of Fisheries (WDF) and Washington Department of Wildlife (WDW). 1993. 1992 Washington State salmon and steelhead stock inventory - Appendix three Columbia River stocks. Washington Dept. Fish and Wildlife, 600 Capitol Way N, Olympia, WA. 98501-1091. 580 pp.

Washington Department of Fish and Wildlife (WDFW). 1997. Wild Salmonid Policy, draft environmental impact statement. Washington Dept. of Fish and Wildlife. Olympia, Wa.

Washington Department of Fish and Wildlife (WDFW). 2001 (updated Oct, 2003). Fisheries Management and Evaluation Plan (FMEP), Lower Columbia River. Washington Dept. of Fish and Wildlife. Olympia, Wa.

Washington Department of Fish and Wildlife (WDFW). 2001. Steelhead rearing guidelines. Fish Program, Science Division, Washington Department of Fish and Wildlife. Olympia, Wa.

Washington Department of Fish and Wildlife (WDFW). 1987-2003. Semi-Annual Operations Reports for Lower Columbia Fisheries Development Program Mitchell Act Hatcheries (Washington State). Washington Dept. of Fish and Wildlife. Olympia, Wa.

Washington Joint Natural Resources Cabinet and Washington Department of Fish and Wildlife. 1998. Lower Columbia Steelhead Conservation Initiative (LCSCI). State of Washington. Olympia, Wa.

Watson, D.G. 1973. Estimate of steelhead trout spawning in the Hanford Reach of the Columbia River. Battelle, Pacific Northwest Laboratories, Richland, WA.

Wipfli, M.S., J. Hudson, and J. Caouette. 1998 Influence of salmon carcasses on stream productivity: response of biofilm and benthic macroinvertebrates in southeastern Alaska, U.S.A. Can J. Fish. Aquat. Sci. 55: 1503-1511.

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. S.P. Cramer and Associates, Inc., 600 NW Fariss, Gresham, Oregon

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:_____