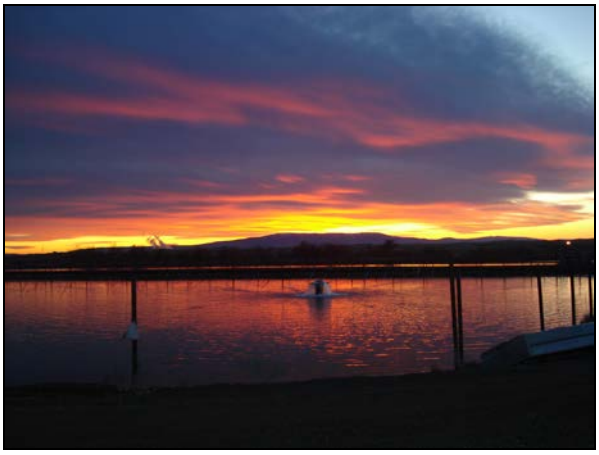
HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)



Aerial photo from Google Maps (2014); Ringold Pond photo provided by WDFW Hatcheries staff.

Hatchery Program:	Ringold Springs Rearing Facility (RSRF) Summer Steelhead (segregated)
Species or Hatchery Stock:	Summer Steelhead (*Oncorhynchus mykiss*) Wells Hatchery Summer Steelhead Stock
Agency/Operator:	Washington Department of Fish and Wildlife
Watershed and Region:	Mid-Columbia Sub-basin
Date Submitted:	
Date Last Updated:	October 27, 2014

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Executive Summary

The Washington Department of Fish and Wildlife (WDFW) is submitting a Hatchery Genetic Management Plan (HGMP) for the Ringold Springs Rearing Facility (RSRF) summer steelhead program to the National Marine Fisheries (NMFS) for consultation under Section 10(a)(1)(A) of the Endangered Species Act (ESA). Wells Hatchery summer steelhead (*Oncorhynchus mykiss*) were listed as Endangered under the ESA on August 18, 1997 (62FR43937); downlisted to "Threatened" on January 5, 2006 (71FR834); reclassified as "Endangered" status per U.S. District Court decision in June 2007 (*Trout Unlimited v Lohn*, C06–0483–JCC, 2007); status downlisted again to "Threatened" per U.S. District Court order in June 2009 (74FR2605); reaffirmed "Threatened" by five-year status review, completed on August 15, 2011 (79FR20802).

This HGMP is built around the principles and recommendations of the Hatchery Scientific Review Group (HSRG). These principles and recommendations represent the best science available for operating hatchery facilities consistent with the conservation of salmonid species. The RSRF steelhead program will be operated as a "segregated" program with the intent for the hatchery population to represent a distinct population that is reproductively isolated from naturally-spawning populations. Segregation is achieved by using returning adult hatchery-origin summer steelhead, distinguished by an adipose fin-clip (AD) returning to the Columbia River at Wells Hatchery and/or Ringold Springs Rearing Facility, and by operating the program in a manner to limit gene flow to the natural origin population. All fish released from the Ringold Springs hatchery program are uniquely mass-marked with an AD + right ventral fin (RV)-clip.

The Ringold Springs program will be operated to provide fish for harvest while minimizing adverse effects on natural origin Upper Columbia River fish. Hatchery steelhead are released to mitigate for the loss of wild steelhead harvest in sport, commercial, and tribal fisheries due to federal hydropower construction and habitat degradation in the Columbia River Basin. Adult returns from this production provide steelhead that support a popular fishery in the Hanford Reach area of the Columbia River (terminal fishery) as well as enhance the lower, mid, and upper Columbia River sport and tribal fisheries. Adult steelhead returning to the RSRF have been designated as a "reserve stock" for the Upper Columbia DPS. In this role, RSRF may provide adults to meet hatchery production goals for both the Wells and Ringold Springs programs.

Broodstock Collection and Juvenile Release:
Broodstock for the RSRF production are collected from adults that are trapped at Wells Dam and held at Wells Hatchery. Eggs from the earliest-spawned fish collected at Wells Hatchery are used for RSRF and mating intent is HxH crosses. A total of 290,000 green eggs are needed for the Ringold Springs program, which requires approximately 58 females. In 2014, and potentially in future years, all or a portion of the broodstock collection, incubation, and rearing will occur at the RSRF.

Fry are transferred from Wells Hatchery to Ringold Springs in late-April. Once at the RSRF, the steelhead are initially reared in vinyl raceways and are moved to the five-acre earthen pond in December/early-January. Fish are released in April, from the five-acre pond into the hatchery creek (Spring Creek) which flows into the Columbia River at RKm 567. The RSRF steelhead release goal is 180,000 annually. Over the past eight years, releases from the RSRF have averaged 150,605 steelhead, and ranged from 134,164 to 186,143 smolts).

Harvest:
The primary fishery supported by the RSRF steelhead adult returns is in the Hanford Reach area of the mainstem Columbia River, adjacent to the Hatchery. Adult returns from this production also provide harvestable steelhead to enhance the lower and mid-Columbia River sport and tribal fisheries. Summer steelhead enter fisheries in the lower Columbia River from March through October, and most of the catch occurs in these fisheries from late-May through August. In the terminal fishery (Hanford Reach), the fishery opens on October 1, and continues through April 15 of the following year. Selective harvest regulations allow only the harvest of adipose fin-clipped summer steelhead in the lower Columbia River

to protect wild summer steelhead. Similarly, the unique AD+RV mass-marked RSRF steelhead provides a targeted fishery in the Hanford Reach in October that allows anglers to harvest RSRF steelhead while releasing differentially-marked Upper Columbia River hatchery steelhead. The Hanford Reach steelhead fishery can be expanded to include the harvest of any hatchery steelhead in September/October if steelhead returns to the upper Columbia River are sufficient in numbers of hatchery- and wild-origin fish to allow the opening of fisheries in those areas for the removal of excess hatchery steelhead. Steelhead recovered at RSRF trap in the fall are marked with a caudal fin-clip, transported, and released into the Columbia River approximately twelve miles downstream of the hatchery to provide additional harvest opportunity.

Harvest in the terminal fishery over the past thirteen years has averaged 1,667 steelhead, and ranged from 802 (2012-2013) to 3,018 (2009-2010). Fishing effort on steelhead by anglers the Hanford Reach has averaged 26,543 hours per year, and ranged from 17,476 hours (2012-2013) to 35,843 (2009-2010).

Monitoring and Evaluation:
Adult steelhead and fall Chinook returns to the RSRF trap are routinely monitored in the fall from September through December. Each fish is enumerated, and marks (fin-clips) and gender are recorded. Recaptures (steelhead) are also noted. Catch and harvest is monitored in-season in the terminal fishery from August through April annually to estimate catch, harvest, and impacts to ESA-listed wild steelhead. Specific harvest rates for the hatchery steelhead outside of the terminal area are unknown; however, catch record "punch card" (CRC) estimates for harvest of hatchery steelhead are available by CRC area and month for all areas open to sport harvest.

Smolt-to-adult survival rates from Ringold Springs releases can only be estimated for release years 2008 through 2011. Prior to 2008, release estimates did not account for avian predation losses in the earthen pond and are considered unreliable. In 2008, hatchery staff deployed a Smith-Root impedance fish counter on the rearing pond outlet allowing accurate enumeration of the release. On average, 80% of adults return as 1-salts and SAR range from 0.9% – 2.9% (mean = 1.9%) for release years 2008 through 2011. SARs are calculated from the terminal fishery catch and do not include RSRF steelhead harvested in the lower and middle Columbia River sport, commercial, and tribal fisheries. Due to a lack of coded-wire tag studies and limitations that not all fish can be accounted for as being harvested, smolt-to-adult survival rates (SAR) are likely underestimated.

Operation and Maintenance of Hatchery Facilities:
Water to the RSRF is supplied by springs located east of the facility, which provides gravity flow of 58-60°F water year-around. Temperatures in the rearing receptacles can range from 52°F to 62°F. Outflow from the rearing ponds and raceways join un-used spring water to create Spring Creek, which flows into the Columbia River at RKm 567. Surface water rights from the Ringold Springs source, totaling 70 cfs for continuous fish propagation, are formalized through the Washington Department of Ecology. Monitoring and measurement of water usage is reported in monthly NPDES reports.

1 SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1 Name of hatchery or program.

Ringold Springs Rearing Facility (RSRF) - Summer Steelhead

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

Wells Summer Steelhead (*Oncorhynchus mykiss*) were listed as *Endangered* under the ESA on August 18, 1997 (62FR43937); down-listed to *Threatened* on January 5, 2006 (71FR834); reclassified as *Endangered* status per U.S. District Court decision in June 2007 (*Trout Unlimited v Lohn*, C06–0483–JCC, 2007); status down-listed again to *Threatened* per U.S. District Court order in June 2009 (74FR2605); reaffirmed *Threatened* by five-year status review, completed on August 15, 2011 (76FR50448); updated April 14, 2014 (79FR20802).

1.3 Responsible organization and individuals

Hatchery Operations Staff Lead Contact

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Fish Management Staff Lead Contact

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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

NOAA-National Marine Fisheries Service (NMFS) – Manager of Mitchell Act Funds

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

Funding Source	Operational Information (FY 2014)
Mitchell Act via National Marine Fisheries Service (NMFS)	Full time equivalent staff – 2.0 Annual operating cost (dollars) - $225,877 (including agency indirect)

1.5 Location(s) of hatchery and associated facilities.

Broodstock Sources:

1) Wells Hatchery,
2) Ringold Springs Rearing Facility (RSRF),
3) Hanford Reach Angler Broodstock Collection (ABC) Program (Columbia River)

Table 1.5.1: Location of culturing phases, by facility.

Facility	Culturing Phase	Location
Ringold Springs Hatchery (RSRF)	Broodstock collection; Adult holding (short-term in-river); Spawning; Incubation; Rearing; Acclimation	Located at RKm 567 (RM 352), Lower Middle Columbia River (WRIA 36).
Wells Hatchery	Broodstock collection; Adult holding; Spawning; Incubation; Early-Rearing	Located at RKm 829, Mid-Upper Columbia River (WRIA 47).
In-River (Columbia River)	Broodstock collection	Volunteer angler broodstock collection (ABC) via hook-and-line in the Columbia River, adjacent to the RSRF (RKm 567).

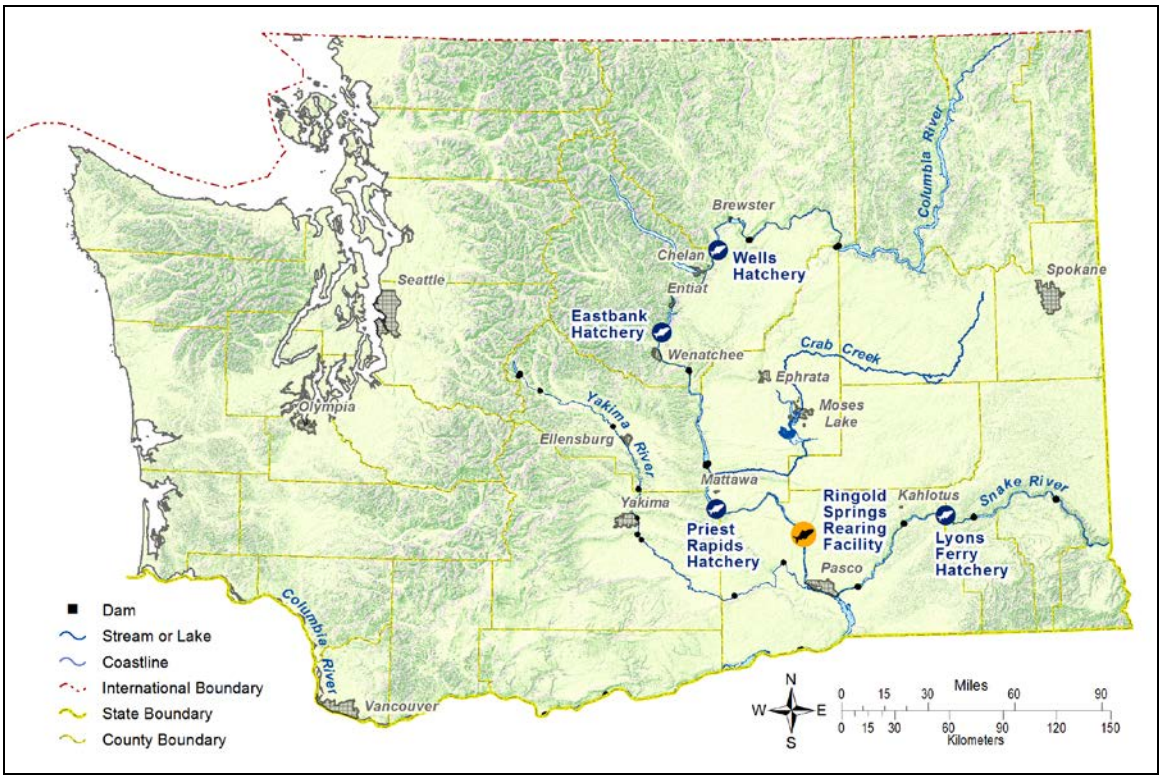

Figure 1.5.1: Map showing Ringold Springs Rearing Facility and Wells Hatchery. Source: WDFW GIS Unit.

1.6 Type of program.

Segregated - Harvest.

1.7 Purpose (Goal) of program.

Mitigation: Rear and release 180,000 (up to + 10%) adipose fin-clipped and right ventral fin-marked steelhead smolts 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: Although the main focus is on harvest, this program can also provide a source of Upper Columbia River (UCR) Wells steelhead if needed. Adult steelhead returning to the RSRF have been designated as a "reserve stock" for the Upper Columbia DPS. In this role, RSRF may provide adults to meet hatchery production goals for both the Wells Hatchery and Ringold Springs programs.

1.8 Justification for the program.

The program will be operated to provide fish for harvest while minimizing adverse effects on natural-origin UCR steelhead. Hatchery steelhead are released to mitigate for the loss of wild 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. The targeted terminal fishery is in the mainstem Columbia, adjacent to the RSRF area. In addition, adult returns from this production provide harvestable steelhead to enhance the lower and mid-Columbia River sport and tribal fisheries for the purpose of hatchery adult management on the spawning grounds to reduce pHOS.

AD+RV mass-marked RSRF steelhead provides a targeted fishery in October that allows anglers to harvest RSRF steelhead while releasing differentially marked UCR hatchery steelhead. The fishery can be expanded to include the harvest of all hatchery steelhead if steelhead retention is opened in the upper Columbia River by WDFW's Region 2.

The RSRF is located upstream of the listed Middle Columbia River (MCR) steelhead and downstream of listed UCR 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 ESA Section 10 permit (#1554, August 20, 2010) for any incidental take of UCR steelhead in the Ringold Springs-origin targeted steelhead fishery upstream of the old Hanford townsite wooden powerline tower crossing at RKm 604.5. The Hanford Reach steelhead fishery downstream of this location is covered by the lower Columbia fishery Section 7 consultation.

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

Table 1.8.1: Summary of risk aversion measures for the Ringold Springs hatchery steelhead program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.2	Surface water rights certified by the Department of Ecology include: S3-00408C (30 cfs), S3-283301C (10 cfs), S3-27815C (15 cfs) and S3-27816C (15 cfs) for a total of 70 cfs (all from Ringold Springs). An application is pending for a 10 cfs diversion for fish propagation from the Columbia River (S3-29444). Monitoring and measurement of water usage is reported in monthly NPDES reports.
Intake Screening	4.2	The river water intake at Ringold Springs is screened to be in compliance with current NMFS guidelines (NMFS 2011c) to protect juvenile fishes. However, the Columbia River intake is no longer used because WDFW does not have an approved water right. The RSRF water supply does not have any fish in the system and is not screened.
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 and Adult Passage	7.9	Listed fish are not collected for this program, nor is broodstock collected at this facility. There are no adult passage issues with this program.

Disease Transmission	9.2.7, 10.11	The *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006) details hatchery practices and operations designed to stop the introduction and/or spread of any diseases. Also, hatchery practices and operations specific to the Columbia Basin are described in the Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995).
Competition and Predation	2.2.3, 10.11	Hatchery fish are reared to meet Statewide Steelhead Rearing and Release Guidelines (Tipping 2001). Steelhead smolts are released in May to foster rapid migration to marine waters and to allow juvenile listed fish to grow to a size that reduces the potential for predation.

1.9 List of program "Performance Standards".

See HGMP section 1.10.

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

1.10.1 "Performance Indicators" addressing benefits.

Table 1.10.1.1: "Performance Indicators" addressing benefits.

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.1.1 Mitchell Act-funded program contributes to fulfilling tribal trust responsibility mandate and treaty rights as described in *U.S. v Oregon*	Contributes to co-manager harvest	Participate in annual coordination between co-managers to identify and report on issues of interest, coordinate management, and review programs (FBD process).
3.1.2 Program contributes to mitigation requirements	This program provides mitigation for lost fish production due to hydroelectric development within the Columbia River Basin and contributes to a meaningful harvest in sport and commercial fisheries.	Returns to RSRF and contribution to the terminal sport fishery will be estimated for each brood year released. Work with Co-managers to manage adult fish in excess of broodstock need.
3.1.3 Program addresses ESA responsibilities	This HGMP has been submitted for program authorization under auspices of the ESA.	HGMP updated and re-submitted to NOAA with significant changes or under permit agreement.
3.2.1 Steelhead produced at RSRF are intended for harvest and are produced and released in a manner enabling effective harvest, while avoiding overharvest of non-target species/stocks.	Externally-marked hatchery fish enable mark-selective fisheries, which reduces harvest mortality on non-targeted wild/natural-origin fish to post-release incidental hooking mortality.	Annually mass-mark hatchery steelhead releases to differentiate hatchery from natural-origin fish and record estimates of mark rate. Harvests and hatchery returns are monitored by agencies to provide up-to-date information. See HGMP section 3.3.1.
3.3.2 Releases are sufficiently marked to allow statistically significant evaluation of program contribution to natural	100% of hatchery releases are identifiable as hatchery-origin fish. RSRF steelhead are mass-marked with adipose fin-clip +	Annual estimates of mass-mark rate of all hatchery releases at the hatcheries prior to release. Quality control (QC) estimates

production, and to evaluate effects of the program on the local natural population	right ventral fin-clip (AD+RV).	of both adipose clip rate and right ventral clip rate are generated each year at RSRF.
3.4.1 Implement measures for broodstock management to maintain integrity and genetic diversity	Sufficient hatchery adult pairs (50 – 60) are collected to yield 250,000 eggs/fry for the 180,000 smolt segregated program. Broodstock will be collected at RSRF and/or Wells Hatchery.	Annual run timing, age and sex composition are collected. Adhere to HSRG Guidelines (2004) and WDFW spawning guidelines. (Seidel 1983).
3.8.3 Non-monetary societal benefits for which the program is designed are achieved.	Recreational fishery angler-days, length of season, number of licenses purchased	Annual creel surveys to estimate fishing effort and harvest; lagged review of CRC estimates.

1.10.2 "Performance Indicators" addressing risks.

Table 1.10.2.1 "Performance Indicators" addressing risks.

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.2.1. Harvest of hatchery-produced fish minimizes impact to wild populations.	Harvest is regulated to protect unmarked wild steelhead. . Mass mark juvenile hatchery fish prior to release to enable state agencies to implement selective fisheries.	Terminal sport harvest is monitored in real-time by WDFW through creel census. Adult straying estimates, NOR/HOR ratio on the spawning grounds, RSRF fish health documented before smolt release. See also HGMP section 3.3.1.
3.2.2 Release groups are marked in a manner consistent with information needs and protocols to estimate impacts to natural and hatchery origin fish.	See *3.3.2* in **Table 1.10.1.1**.	Examine returning fish for the fin-marks at the RSRF trap. Annually monitor and report numbers of hatchery (marked) and natural (unmarked) fish. As adopted in the *Statewide Steelhead Management Plan* (*SSMP 2008)*, segregated harvest programs are to result in an average gene flow of less than 2% from the hatchery to the wild stock for primary populations as well as a pHOS of less than 5%. Performance standards for contributing are <10% and maintaining current conditions for stabilizing (HSRG 2009).
3.4.2 Broodstock collection does not significantly reduce potential juvenile production in natural rearing areas.	Number of spawners of natural-origin removed for broodstock.	Trap is checked daily. Only marked hatchery fish are used for broodstock purposes. Natural-origin fish, when encountered, are returned to the river. Broodstock are collected at RSRF and/or Wells Dam.
3.5.1 Patterns of genetic variation within and among natural populations do not change significantly as a result of artificial production.	Within and between populations, genetic structure is not affected by artificial production.	Currently not monitored. See HGMP section 11.1 for proposed monitoring. No natural steelhead production within the Hanford Reach in proximity to RSRF.

3.5.3 Artificially-produced adults in natural production areas do not exceed appropriate proportion of the total natural spawning population.	The ratio of observed and/or estimated total numbers of artificially-produced fish on natural spawning grounds, to total number of naturally-produced fish (pHOS).	Spawning ground surveys and dam fish counts conducted in the Columbia Basin and tributaries allow an assessment of straying from these Ringold releases.
3.5.4. Juveniles are released on-station or after sufficient acclimation to maximize homing ability to intended return locations	Fish are released after acclimation per WDFW Steelhead Rearing Guidelines (Tipping 2001).	RSRF steelhead are reared for 12 months on a unique spring water source to maximize imprinting and adult homing fidelity. They are volitionally released on-site.
3.5.5 Juveniles are released at fully-smolted stage.	Level of smoltification at release. Release type (forced, volitional or direct).	Fish are released at 5 fpp per WDFW Steelhead Rearing Guidelines (Tipping 2001).
3.7.1 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.	Annual reports indicating levels of compliance with applicable standards and criteria. Periodic audits indicating level of compliance with applicable standards and criteria.	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. The program is operated consistent with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006).
3.7.2 Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring.	Discharge water quality compared to applicable water quality standards by NPDES permit. WDFW water right permit compliance.	Flow and discharge reported in monthly NPDES reports.
3.7.3 Water withdrawals and in-stream water diversion structures for hatchery facility will not affect spawning behavior of natural populations or impact juveniles.	Water withdrawals compared to NOAA-NMFS, USFWS and WDFW applicable passage and screening criteria for juveniles and adults.	Not applicable at RSRF. Spring water source does not support fish populations. No Columbia River diversion.
3.7.4 Releases do not introduce pathogens not already existing in the local populations, and do not significantly increase the levels of existing pathogens. Follow the *Co-Managers' Salmonid Disease Control Policy* (WDFW and WWTIT 1998, updated 2006).	Certification of fish health during rearing and immediately prior to release, including pathogens presence and virulence.	WDFW Fish Health Section inspects adult broodstock yearly for pathogens and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. 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 *Salmonid Disease Control Policy of the Fisheries Co-Managers of*

		Washington State (WDFW and WWTIT 1998, updated 2006).
	• 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	Controls of specific fish pathogens through eggs/fish movements are conducted in accordance with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006).
3.7.6 Adult broodstock collection operation does not significantly alter spatial and temporal distribution of any naturally-produced population.	Spatial and temporal spawning distribution of natural populations above and below weir/trap currently compared to historic distribution.	Trap is checked daily. When natural-origin steelhead are encountered, they are safely returned to the river.
3.7.8 Predation by hatchery fish does not significantly reduce numbers of natural fish.	Hatchery juveniles are raised to smolt-size and released from the hatchery at a time that fosters rapid migration downstream.	Hatchery smolt release size and time are monitored to quantify/minimize predation effects on naturally-produced fish (Sharpe et al. 2008, Pflug et al. 2013) (see also HGMP section 2.2.3). Snow et al. 2013 provides predation estimates.
3.8.1 Cost of program operation does not exceed the net economic value of fisheries in dollars per fish for all fisheries targeting this population.	Total cost of operation.	Compare annual operational cost of program to calculated fishery contribution value (Wegge 2009).

1.11 Expected size of program.

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

Broodstock are collected at Wells Hatchery and (beginning in 2014) Ringold Springs Rearing Facility; 373 to 420 adults are needed to meet Wells Hatchery goals for the UCR production for the Methow and Okanogan rivers and the RSRF program (see also NMFS Section 10 (a)(1)(b) Permit for Take of Endangered or Threatened Species #1347). A total of 290,000 green eggs are needed for the RSRF program, which requires approximately 58 females depending on seasonal fecundities.

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

Table 1.11.2.1: Proposed annual fish release levels (maximum number) by life stage and location.

Age Class	Release Goal	Location			
		Stream	Release Point (RKm)	Major Watershed	Eco-province
Yearling	180,000	Spring Creek (WRIA 36); Tributary to the Columbia River at RKm 567.	567.0	Upper-Middle Columbia River	Columbia Plateau

Source: Future Brood Document 2014.

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 Springs releases can only be estimated for smolt release years 2008-11. Prior to 2008, release estimates did not quantify or attempt to account for avian predation losses and are unreliable. In 2008, hatchery staff deployed a Smith-Root impedance fish counter on the rearing pond outlet allowing accurate enumeration of the release (note release over-estimates for release years 2006 and 2007 in **Table 1.12.1**). **Table 1.12.1** shows that on average 80% of adults return as 1-salts and SAR ranged from 0.9% – 2.9% (mean = 1.9%) for release years 2008-11.

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). Hence, the RSRF program shows less variability and slightly higher performance measured by SAR.

Table 1.12.1: Ringold Springs summer steelhead program performance metrics.

						Age Composition		Adult Return Based on Catch		Adult Return Based on Harvest	
Release Year	Brood Year	Fish Released	Year	Catch	Harvest	1-Salt	2-Salt	1-Salt	2-Salt	1-Salt	2-Salt
2015	2014		2014-15								
2014	2013	142,991	2013-14	1,356	814	0.874	0.126	1,185	171	711	103
2013	2012	169,398	2012-13	1,605	874	0.737	0.263	1,183	422	644	230
2012	2011	186,143	2011-12	3,278	1,512	0.856	0.144	2,806	472	1,294	218
2011	2010	144,438	2010-11	1,886	1,330	0.793	0.207	1,496	390	1,055	275
2010	2009	137,051	2009-10	4,921	3,106	0.710	0.290	3,494	1,427	2,205	901
2009	2008	140,047	2008-09	4,506	2,672	0.837	0.163	3,772	734	2,236	436
2008	2007	134,164	2007-08	2,194	1,286	0.920	0.080	2,018	176	1,183	103
2007*	2006	258,200	2006-07	2,308	1,715	0.722	0.278	1,666	642	1,238	477
2006*	2005	265,382									

* juvenile releases were estimated (shaded areas)

Juvenile releases are enumerated at release with an impedance counter (2008-2014)

			SAR based on Catch			
Release Year	Brood Year	Fish Released	1-Salt	2-Salt	Total	SAR*
2014	2013	142,991				
2013	2012	169,398				
2012	2011	186,143	1,185		1,185	
2011	2010	144,438	1,183	171	1,354	0.009
2010	2009	137,051	2,806	422	3,228	0.024
2009	2008	140,047	1,496	472	1,968	0.014
2008	2007	134,164	3,494	390	3,884	0.029
Mean		**150,605**	**2,033**	**364**	**2,324**	**0.019**

* does not include adult harvest contributions to fisheries other than the terminal fishery

Source: Paul Hoffarth, WDFW District 4 Fish Biologist 2014.

Sport harvest occurs in the targeted Ringold bank fishery, but also in the Columbia mainstem downstream from the Old Hanford townsite wooden powerline towers (RKm 580).

Table 1.12.2: Sport harvest figures from Highway 395 to Priest Rapids Dam in the Ringold Springs area.

Return Year	Harvest		
	Hatchery	Wild	H&W Total
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	1,764	0	1,764
2002/03	1,333	0	1,333
2003/04	2,698	0	2,698
2004/05	1,824	0	1,824
2005/06	1,069	0	1,069
2006/07	1,715	0	1,715
2007/08	1,281	5	1,286
2008/09	2,672	0	2,672
2009/10	3,103	3	3,106
2010/11	1,330	0	1,330
2011/12	1,512	0	1,512
2012/13	874	1	875
2013/14	814	0	814
Average	**1,710**	**10**	**1,720**

Source: 1996/97- 2000/01 WDFW catch record cards (CRC) data. 2001/02 -2013/14 WDFW Creel Surveys.

Table 1.12.3: Summer steelhead returns to Ringold Springs Rearing Facility.

Return Year	Adults	Jacks
2002	830	0
2003	203	0
2004	1,123	1
2005	525	0
2006	210	0
2007	424	0
2008	34	0
2009	266	0
2010	355	0
2011	264	0
2012	129	0
2013	209	0
Average	**381**	**0**

Source: Hatchery Headquarters Database 2013.

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

The first year of operation for this hatchery was 1963.

1.14 Expected duration of program.

The program is on-going with no planned termination.

1.15 Watersheds targeted by program.

Middle Columbia River (lower Hanford Reach).

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.

Recent construction (March 2014) of incubation and early rearing facilities will allow full-term rearing of Wells stock steelhead. This includes the infrastructure/equipment to chill the water to appropriate temperatures (52°F) for incubation. Facility problems, particularly in relation to the 5-acre pond, include: water supply pipeline age-related vulnerability, avian predation, facility maintenance and upgrades, etc. The "temporary" vinyl raceways built in the 1960s as a 10-year short-term fix are still in use, and need to be replaced with modern, concrete raceways. These raceways are planned for replacement as part of the U.S. Army Corps of Engineers (USACE) John Day Mitigation fall chinook build-out at Ringold Springs.

1.16.2 Potential Alternatives to the Current Program.

Develop local broodstock to avoid dependence on other facilities, and to avoid straying. This alternative is currently being implemented with existing Mitchell Act funding. A chilled water incubation facility has been constructed, and 210,000 green eggs were incubated (April 2014); resulting in approximately 90,000 fingerlings reared from this initial brood collection (October 2014). The USACE John Day Mitigation (JDM) fall Chinook build-out will result in drilling a new well to provide the cooler well water necessary for extended adult holding. Currently, mature or nearly-mature adults are collected at the trap or by volunteer anglers in March/April; these are spawned immediately or within a week, so cold ground water is not necessary for adult holding.

1.16.3 Potential Reforms and Investments.

The entire RSRF 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. (USACE JDM build-out item);
- Installing permanent bird predation systems over all steelhead rearing vessels. (Part WDFW Capital Budget Request and part USACE JDM build-out item);
- 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. (USACE JDM build-out item; completely new adult fishway/trap/holding facility to be constructed);
- Various safety and leakage concerns on intakes, outlets and other water delivery systems need to be addressed. (USACE JDM build-out item);
- Construct new feed, equipment, and chemical storage building with loading dock and domestic well building. (USACE JDM build-out item); and
- Replace siding on the main hatchery building, including installation of garage doors, roof vents, heaters, and both residences. (WDFW Capital Budget Request);

Multiple concerns with in river pump intake need to be addressed. These include:

- Extending existing intake pipeline and screen further into the river and/or construction of a log boom and trash rack;
- A waterproof chamber for housing the river intake and compressor, or engineering the pump design to higher ground to prevent flooding of motor; and
- No river water right at this time: application for 10 cfs continuous diversion from January 1 through March 31, annually, to supplement low flow from springs pending with WDOE since April 1, 1993. River diversion is no longer used until water right secured.

2 SECTION 2. PROGRAM EFFECTS ON NMFS ESA-LISTED SALMONID POPULATIONS. (USFWS ESA-Listed Salmonid Species and Non-Salmonid Species are addressed in Addendum A)

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

Direct Take Permit #1395 (FR 02-19431). WDFW has an ESA Section 10 Permit #1395 (artificial propagation to enhance ESA-listed steelhead), which authorizes annual take of adult and juvenile, endangered, Upper Columbia River (UCR) spring Chinook salmon and threatened 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.

Indirect Take Permit #1554 (FR 05-23285). WDFW has an ESA Section 10 Permit #1554 (June 20, 2008) for any incidental take of listed UCR spring Chinook and UCR listed summer steelhead in the Ringold Springs summer steelhead fishery. The timing of the lower Hanford Reach/Ringold steelhead fishery (September – October opening) precludes the take of any UCR spring chinook.

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

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

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

Middle Columbia River steelhead (*Oncorhynchus mykiss*): Were listed as *Threatened* under the ESA on March 19, 1998 (64FR14517); *Threatened* status reaffirmed on January 5, 2006 (71FR834); reaffirmed *Threatened* by five-year status review, completed on August 15, 2011 (76FR50448); updated April 14, 2014 (79FR20802). NMFS has defined DPSs of steelhead to include only the anadromous members of this species (70FR67130). NMFS recognizes that there may be situations where reproductive contributions from resident rainbow trout may mitigate short-term extinction risk for some steelhead DPSs (Good et al. 2005, 70FR67130). The DPS includes all naturally spawning populations of steelhead using tributaries upstream and exclusive of the Wind River, Washington, and the Hood River, Oregon, excluding the upper Columbia River tributaries (upstream of Priest Rapids Dam) and the Snake River (Ford 2011).

Upper Columbia River steelhead (*Oncorhynchus mykiss*): Were listed as *Endangered* under the ESA on August 18, 1997 (62FR43937); down listed to *Threatened* on January 5, 2006 (71FR834); reclassified as *Endangered* status per U.S. District Court decision in June 2007 (*Trout Unlimited v Lohn*, C06–0483–JCC, 2007); status upgraded to *Threatened* per U.S. District Court order in June 2009 (74FR2605); reaffirmed *Threatened* by five-year status review, completed on August 15, 2011 (76FR50448); updated April 14, 2014 (79FR20802). NMFS has defined DPSs of steelhead to include only the anadromous members of this species (70FR67130). NMFS recognizes that there may be situations where reproductive contributions from resident rainbow trout may mitigate short-term extinction risk for some steelhead DPSs (Good et al. 2005, 70FR67130). The Upper Columbia River Steelhead DPS includes all naturally-spawned anadromous steelhead populations below natural and manmade impassable barriers in streams in the Columbia River basin upstream from the Yakima River, Washington, to the U.S.-Canada border, as well as six artificial propagation programs: the Wenatchee River, Wells Hatchery (in the Methow and Okanogan rivers), Winthrop National Fish Hatchery (NFH), Omak Creek, and the Ringold steelhead hatchery programs.

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

Upper Columbia River Spring-Run Chinook salmon (*Oncorhynchus tshawytscha*): Were listed as *Endangered* under the ESA on March 24, 1999 (64FR14308); *Endangered* status reaffirmed on June 28, 2005 (70FR37160); reaffirmed *Threatened* by five-year status review, completed on August 15, 2011 (76FR50448); updated April 14, 2014 (79FR20802). The Upper Columbia Spring-run Chinook Salmon DPS includes naturally spawning Chinook salmon in the major tributaries entering the Columbia River upstream of Rock Island Dam and the associated hatchery programs (70FR37160).

2.2.2 <u>Status of NMFS ESA-listed salmonid population(s) affected by the program.</u>

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

Upper Columbia River Steelhead: Updated Risk Summary: UCR steelhead populations have increased in natural-origin abundance in recent years, but productivity levels remain low. The proportions of hatchery-origin returns in natural spawning areas remain extremely high across the DPS, especially in the Methow and Okanogan river populations. The modest improvements in natural returns in recent years are probably primarily the result of several years of relatively good natural survival in the ocean and tributary habitats. Tributary habitat actions called for in the *Upper Columbia Salmon Recovery Plan* are anticipated to be implemented over the next 25 years and the benefits of some of those actions will require some time to be realized. Overall, the new information considered does not indicate a change in the biological risk category since the time of the last Biological Review Team (BRT) status review (Ford 2011).

Current Status: Recovery Plan Viability Criteria: All four populations of upper Columbia River steelhead remain rated at high risk after incorporating six additional years of status information into the assessment against the Interior Columbia River Basin Technical Recovery Team (ICTRT) viability criteria (**Tables 2.2.2.1** and **2.2.2.2**). The most recent estimates of natural-origin abundance (10-year geometric mean) and natural-origin productivity at low to moderate parent abundance remain well below minimums defined by the ICTRT viability curves for the DPS. Spawning escapements into natural areas, especially for the Methow and Okanogan populations, continue to show a high proportion of hatchery origin. Productivities, assuming the hatchery-origin and natural-origin spawners are contributing to natural production at the same effectiveness, are below replacement even at low to moderate spawning levels for all four populations (Ford 2011).

Table 2.2.2.1: Viability assessments for Upper Columbia River steelhead populations, updated to reflect return years through 2009. Natural spawning abundance: most recent 10-year geometric mean (range). ICTRT productivity: 20-year geometric mean for parent escapements below 75% of population threshold (90% confidence limits).

Population	Abundance and Productivity Metrics				Spatial structure and diversity metrics			Overall Viability Rating
	ICTRT Min Threshold	Natural Spawning Abundance	ICTRT Productivity	Integrated A/P Risk	Natural Process Risk	Diversity Risk	Integrated SS/D Risk	
Wenatchee R.								
2000-2009	1,000	795 (365-1947)	0.87 (0.44-1.74)	High	Low	High	High	High Risk
1994-2003		559 (241-1947)	0.84 (0.68-1.39)					
Entiat River								
2000-2009	500	112 (52-263)	0.55 (0.35-0.88)	High	Moderate	High	High	High Risk
1994-2003		79 (31-263)	0.48 (0.30-0.66)					

Methow River **2000-2009** 1994-2003	1,000	**468** (256-703) 289 (68-554)	**0.32** (0.14-0.72) 0.28 (0.12-0.81)	High	Low	High	High	High Risk
Okanogan R. 2000-2009 1994-2003	750	147 (84-212) 95 (22-181)	0.15 (0.06-0.35) 0.12 (0.07-0.21	High	High	High	High	High Risk

Source: Ford 2011.

Table 2.2.2.2: North Cascades MPG steelhead risk ratings integrated across the four viable salmonid population (VSP) metrics. Viability key: HV = highly viable, V = viable, M = maintained, and HR = high risk (does not meet viability criteria).

		Spatial structure/diversity risk			
		Very Low	**Low**	**Moderate**	**High**
Abundance/ Productivity risk	**Very Low** (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6-25%)	M	M	M	HR
	High (>25%)	HR	HR	HR	HR Wenatchee R Entiat R Methow R Okanogan R

Source: Ford 2011.

Middle Columbia Steelhead: Updated Risk Summary: There have been improvements in the viability ratings for some of the component populations, but the Middle Columbia River Steelhead DPS is not currently meeting the viability criteria (adopted from the ICTRT) in the Mid-Columbia Steelhead Recovery Plan. In addition, several of the factors cited by the 2005 BRT (Good et al. 2005) remain as concerns or key uncertainties. Natural-origin spawning estimates are highly variable relative to minimum abundance thresholds across the populations in the DPS. Updated information indicates that stray levels into at least the lower John Day River population are also high. Returns to the Yakima River basin and to the Umatilla and Walla Walla rivers have been higher over the most recent brood cycle while natural-origin returns to the John Day River have decreased. Out-of-basin hatchery stray proportions, although reduced, remain very high in the Deschutes River basin. Overall the new information considered does not indicate a change in the biological risk category since the time of the last BRT status review.

Current Status: Recovery Plan Viability Criteria: Two of the five populations in the Cascades Eastern Slope MPG—Fifteen Mile Creek and the Deschutes River (east side)—are currently rated as viable using the ICTRT criteria incorporated into the Mid-Columbia Steelhead Recovery Plan. The Deschutes (west side) population remains rated at high risk driven by relatively low estimates for current productivity and natural-origin abundance versus the DPS-specific viability curve for intermediate sized populations. The data series for the Klickitat River population is not sufficient to allow a rating; however, available mark-recapture-based estimates for two recent years indicate that the population may be functioning at or near viable levels. Data are not available for the remaining extant population (Rock Creek).

The North Fork John Day population continues to be rated highly viable when the data updates through the 2009 spawning year are incorporated into the assessment against recovery plan/ ICTRT criteria. The remaining four populations in the John Day River MPG remain rated as maintained. Natural-origin abundance estimates (ten-year geometric means) are higher in the current assessments for four populations and lower for the Middle Fork John Day River.

Productivity estimates (geometric mean adult progeny-to-parent ratio at low to moderate parent escapements) were generally lower in the updated data series than the estimates generated for the ICTRT status reviews ending in spawning year 2005.

The current status of the Touchet River population remained at high risk, primarily driven by relatively low geometric mean productivity. Natural-origin abundance estimates have increased for the Umatilla and Walla Walla river populations relative to the levels reported in the recovery plan/ICTRT current status reviews (through return year 2005). Productivity estimates for all three extant populations in this MPG are lower than in the previous reviews.

The overall viability ratings have increased from maintained to viable for the Satus Creek population, remain at maintained for the Naches and Toppenish river populations. The overall rating remains at high risk for the upper Yakima River population. The change in ratings for Satus Creek reflects the relatively high annual returns in most years since 2001. Productivity estimates based on the return series updated through 2009 (previously through 2005) have increased or remained at approximately the same levels as estimated in the recovery plan/ICTRT status assessments (Ford 2011).

Table 2.2.2.3: Summary of current status of populations using viability criteria incorporated into the Mid-Columbia Steelhead Recovery Plan. Natural spawning abundance: most recent 10-year geometric mean (range). ICTRT productivity: 20-year geometric mean for parent escapements below 75% of population threshold (90% confidence limits).

Population	Abundance and Productivity Metrics				Spatial structure and diversity metrics			Overall Viability Rating
	ICTRT Min Threshold	Natural Spawning Abundance	ICTRT Productivity	Integrated A/P Risk	Natural Process Risk	Diversity Risk	Integrated SS/D Risk	
Cascades Eastern Slope MPG								
Fifteenmile								
1999-2008	500	675 (225-1,946)	1.83 (0.95-3.54)	Low	Very Low	Low	Low	Viable
1995-2004		695 (236-1946)	1.83 (0.95-3.54)					
Klickitat	1,000	Insufficient data		Moderate[a]	Low	Moderate	Moderate	Maintained?[b]
Eastside Deschutes								
2000-2009	1,000	2730 (1600-8637)	2.31 (1.49-3.60)	Low	Low	Moderate	Moderate	Viable
1995-2004		1633 (462-8637)	2.31 (1.49-3.60)					
Westside Deschutes								
2000-2009	1,000	591 (314-1284)	1.11 (0.68-1.37)	High	Low	Moderate	Moderate	High Risk
1995-2004		410 (108-1284)	1.08 (0.82-1.42)	Moderate	Moderate	Moderate	Moderate	High Risk?[b]
Rock Cr	500	Insufficient data		High[c]				
Wht Salmon R	500	NA[d]	NA	Extinct[c]	NA	NA	NA	Extirpated
Crooked R	2,250	NA	NA	Extinct	NA	NA	NA	Extirpated
John Day MPG								
Upper mainstem								
2000–2009	1,000	558 (149–1,593)	1.25 (1.01–1.56)	Moderate	Very low	Moderate	Moderate	Maintained
1995–2004		487 (185–1,593)	11.56 (1.04–2.31)					
North Fork								
2000–2009	1,500	1,826 (707–4,083)	2.53 (1.57–4.08)	Very low	Very low	Low	Low	Highly viable
1995–2004		1,601 (640–4,083)	2.37 (1.54–3.63)					
Middle Fork								
2000–2009	1,000	672 (213–3,129)	2.28 (1.79–2.90	Moderate	Low	Moderate	Moderate	Maintained
1995–2004		818 (463–3,129)	2.23 (1.84–2.71)					

South Fork								
2000–2009	500	443 (207–984)	1.81 (1.00–2.30	Moderate	Very low	Moderate	Moderate	Maintained
1995–2004		259 (103–984)	1.87 (1.23–2.80)					
Lower mainstem								
2000–2009	2,250	1,881 (508–7,419)	2.98 (1.51–4.32	Moderate	Very low	Moderate	Moderate	Maintained
1995–2004		1,800 (625–7,419)	3.09 (1.96–4.88)					
Umatilla/Walla Walla MPG								
Willow Cr	NA[a]	NA	NA	Extinct	NA	NA	NA	Extirpated
Umatilla R								
2000-2009	1500	2257 (1654-5176)	1.21 (0.48-3.07)	Moderate	Moderate	Moderate	Moderate	Maintained
1995-2004		1200 (769-2451)	1.45 (1.10-1.91)					
Touchet R								
2000-2009	1,000	360 (245-563)	1.46 (0.93-2.30)	High	Lower	Moderate	Moderate	Maintained?
1995-2004		375 (245-563)	1.54 (1.08-2.20)	Moderate? [b]				
Walla Walla R								
2000-2009	1,000	894 (464-1811)	1.42 (0.69-1.92)	Moderate	Very Low	Moderate	Moderate	Maintained
1995-2004		705 (419-1746)	1.34 (1.05-1.68)					
Yakima MPG								
Satus Creek								
2000-2009	500	600 (347-1121)	1.84 (1.42-2.26)	Moderate	Low	Moderate	Moderate	Viable (Maintained)
1995-2004		379 (138-1032)	1.7 (1.33-2.25)					
Toppenish Creek								
2000-2009	500	599 (262-1252)	1.59 (1.81-4.45)	Moderate[f]	Low	Moderate	Moderate	Maintained
1995-2004		322 (57-1252)	1.6 (0.94-2.71)					
Naches River								
2000-2009	1,000	840 (491-1454)	1.25 (1.25-2.01)	High	Low	Moderate	Moderate	Maintained
1995-2004		472 (142-1454)	1.12 (0.75-1.65)					
Upper Yakima								
2000-2009	1,000	151 (60-265)	1.28 (1.17-1.98	High	Moderate	High	High	High Risk
1995-2004		85 (40-265)	1.12 (0.76-1.64)					

Source: Ford 2011.

[a] Moderate A/P rating (provisional) for Klickitat River population based on limited abundance series (estimates for two recent years).
[b] Uncertain due to lack of data, only a few years of data, or large gaps in the data series.
[c] nnual surveys not conducted; therefore, we assumed a provisional A/P rating of High.
[d] NA = not applicable.
[e] Assumed to be functionally extinct (upstream habitat cut off by Condit Dam).
[f] Moderate rating for Toppenish Creek based on high uncertainty in productivity estimates.

Upper Columbia Spring Chinook salmon: Updated Risk Summary: The Upper Columbia Spring-run Chinook Salmon DPS is not currently meeting viability criteria (adapted from the ICTRT) in the *Upper Columbia Salmon Recovery Plan*. Increases in natural-origin abundance relative to the extremely low spawning levels observed in the mid-1990s are encouraging; however, average productivity levels remain extremely low. Large-scale directed supplementation programs are underway in two of the three extant populations in the DPS. These programs are intended to mitigate short-term demographic risks while actions to improve natural productivity and capacity are implemented. While these programs may provide short-term demographic benefits, there are

significant uncertainties regarding the long-term risks of relying on high levels of hatchery influence to maintain natural populations.

The *Upper Columbia Salmon Recovery Plan* includes a number of strategies for improving survival in tributary habitats and the mainstem migration corridor along with complementary harvest management and hatchery management regimes. The time frames for implementing actions and for those actions to result in improved survivals vary across strategies. Improved passage survivals relative to conditions prevalent at the time of listing are expected to be relatively immediate. Given the anticipated action implementation schedule and assumptions regarding time lags for realizing target habitat improvements incorporated into the *Upper Columbia Recovery Plan*, improvements in survival due to changes in habitat conditions are expected to accrue over a 10-50 year period. Overall, the viability of the Upper Columbia spring-run Chinook Salmon DPS has likely improved somewhat since the time of the last BRT status review, but the DPS is still clearly at moderate-to-high risk of extinction (Ford 2011).

Table 2.2.2.4: Viability assessments for Upper Columbia River spring Chinook populations in the North Cascades MPG. Spatial structures and diversity risk ratings from ICTRT 2008.

Population	Abundance and Productivity Metrics				Spatial structure and diversity metrics			Overall Viability Rating
	ICTRT Min Threshold	Natural Spawning Abundance	ICTRT Productivity	Integrated A/P Risk	Natural Process Risk	Diversity Risk	Integrated SS/D Risk	
Wenatchee River								
2000-2009	2,000	449 (119-1050)	0.61 (0.40-095)	High	Low	High	High	High Risk
1994-2003		216 (22-935)	0.75 (0.48-1.18)					
Entiat River								
2000-2009	500	105 (27-291)	1.08 (0.75-1.55)	High	Moderate	High	High	High Risk
1994-2003		59 (10-291)	1.04 (0.72-1.50)					
Methow River								
2000-2009	2,000	307 (79-1979)	0.45 (0.26-0.8)	High	Low	High	High	High Risk
1994-2003		180 (20-1979)	0.76 (0.47-1.24)					
Okanogan River	750	NA	NA	NA	NA	NA	NA	Extirpated

Source: Ford 2011.
NA = not applicable.

Table 2.2.2.5: North Cascades spring-run Chinook MPG population risk ratings integrated across the four viable salmonid population (VSP) metrics. Viability key: HV = highly viable, V = viable, M = maintained, and HR = high risk (does not meet viability criteria).

		Spatial structure/diversity risk			
		Very Low	**Low**	**Moderate**	**High**
Abundance/ Productivity risk	**Very Low** (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6-25%)	M	M	M	HR
	High (>25%)	HR	HR	HR	HR Wenatchee River Entiat River Methow River *Okanogan R (extinct)*

Source: Ford 2011.

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

Table 2.2.2.6: Comparison of current trends to prior reviews of short-term trend in natural-origin spawners, UCR steelhead.

Population		1998 BRT (1987–97)	Previous (1990–2001)	Current (1995–2008)
Wenatchee River	Estimate	0.86	1.05	1.11
	CI	0.81–0.92	1.02–1.07	1.04–1.17
	P > 1.0	0.0002	0.99	0.99
Entiat River	Estimate	0.86	1.04	1.11
	CI	0.80–0.91	1.02–1.07	1.05–1.17
	P > 1.0	0.0001	0.99	0.99
Methow River	Estimate	0.91	1.08	1.17
	CI	0.80–1.03	1.05–1.12	1.11–1.24
	P > 1.0	0.05	1.00	1.00
Okanogan River	Estimate	0.9	1.03	1.16
	CI	0.79–1.02	1.01–1.05	1.10–1.22
	P > 1.0	0.04	0.99	1.00

Source: Ford 2011.

Table 2.2.2.7: Current short-term (since 1995) population growth rate (lambda) estimates versus 2005 BRT short-term time series for the UCR Steelhead DPS.

Population		Hatchery effectiveness = 0		Hatchery effectiveness = 1.0	
		2005 BRT (1990–2001)	Current (1995–2008)	2005 BRT (1990–2001)	Current (1995–2008)
Wenatchee River	Estimate	0.94	1.1	0.72	0.88
	CI	0.36–2.44	0.25–4.92	0.21–2.50	0.16–4.87
	P > 1.0	0.27	0.71	0.09	0.25
Entiat River	Estimate	0.95	1.11	0.74	0.77
	CI	0.33–2.78	0.26–4.66	0.62–0.89	0.18–3.24
	P > 1.0	0.33	0.73	0.01	0.13
Methow River	Estimate	0.93	1.17	0.61	0.7
	CI	0.14–6.16	0.31–4.38	0.18–2.11	0.23–2.12
	P > 1.0	0.35	0.81	0.06	0.07
Okanogan River	Estimate	0.93	1.15	0.54	0.61
	CI	0.13–6.95	0.33–4.06	0.14–2.08	0.22–1.70
	P > 1.0	0.36	0.8	0.05	0.05

Source: Ford 2011.

Table 2.2.2.8: Long-term trends in natural-origin spawning abundance for UCR steelhead populations.

Population	Years	Trend in total spawners	Lambda (HF = 0)		Lambda (HF = 1)	
		Estimate (CI)	Estimate (CI)	P > 1	Estimate (CI)	P > 1
Wenatchee River	1978–2009	1.05 (1.02–1.07)	1.07 (0.87–1.32)	0.78	0.8 (0.67–0.98)	0.02
Entiat River	1978–2009	1.04 (1.02–1.07)	1.05 (0.86–1.27)	0.71	0.79 (0.67–0.93)	0.007
Methow River	1977–2009	1.08 (1.05–1.12)	1.08 (0.89–1.32)	0.82	0.67 (0.59–0.77)	0.0003
Okanogan River	1977–2009	1.03 (1.01–1.05)	1.03 (0.86–1.23)	0.66	0.56 (0.49–0.65)	0.0001

Source: Ford 2011.

Table 2.2.2.9: Short-term trend (expressed as slope of logs of annual natural-origin spawner abundance 1995–2009) expressed as 5-year geometric means (95% CI, P > 1.0).

Population		Short-term trend		
		1998 BRT (1987–97)	Previous (1990–2001)	Current (1995–2008)
Wenatchee River	Estimate	0.88	0.99	1.16
	CI		0.82–1.18	1.04–1.30
	P > 1.0		0.43	0.994
Entiat River	Estimate	0.801	1.01	1.16
	CI		0.87–1.16	1.05–1.28
	P > 1.0		0.53	0.996
Methow River	Estimate	0.85	1.2	1.2
	CI		0.62–1.28	1.03–1.40
	P > 1.0		0.25	0.988

Source: Ford 2011.

Table 2.2.2.10: Short-term population growth rate estimates for UCR spring-run Chinook salmon populations.

Population	Short-term lambda			
	Hatchery effectiveness = 0		Hatchery effectiveness = 1.0	
	2005 BRT (1990–2001)	Current (1995–2008)	2005 BRT (1990–2001)	Current (1995–2008)
Wenatchee River	0.91	1.11	0.83	0.92
	(0.05–16.5)	(0.18–7.06)	(0.05–12.84)	(0.12–7.14)
	0.37	0.7	0.28	0.36
Entiat River	0.94	1.12	0.89	0.995
	(0.13–7.00)	(0.18–7.14)	(0.14–5.58)	(0.14–6.87)
	0.39	0.71	0.29	0.49
Methow River	0.92	1.15	0.84	0.85
	(0.03–24.6)	(0.08–16.12)	(0.04–18.8)	(0.04–20.4)
	0.4	0.69	0.3	0.32

Source: Ford 2011.

Table 2.2.2.11: Long-term trend metrics for UCR spring-run Chinook salmon populations.

Population	Years	Trend in total spawners	Lambda (HF = 0)		Lambda (HF = 1)	
		Estimate (CI)	Estimate (CI)	P > 1	Estimate (CI)	P > 1
Wenatchee River	1960–2008	0.94	0.96	0.26	0.91	0.08
		(0.92–0.95)	(0.83–1.10)		(0.80–1.04)	
Entiat River	1960–2008	0.96	0.98	0.33	0.94	0.12
		(0.94–0.97)	(0.87–1.10)		(0.85–1.05)	
Methow River	1960–2008	0.94	0.96	0.31	0.9	0.08
		(0.92–0.96)	(0.82–1.13)		(0.76–1.06)	

Source: Ford 2011.

- Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

See HGMP section 1.12

Table 2.2.2.12: Upper Columbia River Steelhead DPS natural-origin summer steelhead escapement 2000-2012.

Year	Wenatchee	Entiat	Methow	Okanogan
2000	439	56	284	83
2001	846	109	369	108
2002	2,286	295	615	180
2003	1,011	130	555	163
2004	806	104	717	211
2005	998	128	546	159
2006	1,104	142	474	138
2007	507	65	407	120
2008	890	136	774	233
2009	876	113	724	213
2010	2,599	335	1,285	378
2011	2,568	325	1,182	348
2012	1659	NA	922	271
2013	NA	NA	596	175
Average	**1,276**	**162**	**675**	**199**

Source: SaSI, WDFW 2013. NA=Not yet available.

Table 2.2.2.13: Escapement for Washington State populations of steelhead in the Middle Columbia River steelhead DPS 2000 to 2012.

Year	White Salmon[a]		Klickitat[b]		Rock Creek	Yakima[c]	Touchet[d]	Walla Walla[e]
	Summer	Winter	Summer	Winter				
2000	NA	NA	NA	NA	NA	368	222	409
2001	NA	NA	NA	NA	NA	597	249	595
2002	NA	NA	NA	NA	NA	589	423	1,205
2003	NA	NA	NA	NA	NA	660	424	545
2004	NA	NA	NA	NA	NA	362	181	381
2005	NA	NA	1,252	325	NA	434	342	590
2006	NA	NA	1,751	NA	NA	203	263	549
2007	NA	NA	104	101	NA	189	344	309
2008	NA	NA	62	82	NA	354	225	448
2009	NA	NA	239	152	NA	404	216	574
2010	NA	NA	102	18	NA	896	667	1,175
2011	NA	NA	205	91	NA	742	386	1,083
2012	NA	NA	96	83	NA	611	237	829
2013	NA	NA	NA	NA	NA	NA	390	503
Average	**NA**	**NA**	**476**	**122**	**NA**	**493**	**326**	**657**

Source: SaSI, WDFW 2013
Note: NA = Not yet available.
[a] Escapement is not available for the White Salmon steelhead population.
[b] Steelhead counts on the Klickitat River are from trap counts at the Lyle Falls #5 fishway.
[c] Escapement data is not available for steelhead in the Naches basin.
[d] Escapement estimates are for the Touchet River above Dayton.
[e] Escapement is based off of Nursery Bridge Dam counts.

Table 2.2.2.14: Upper Columbia Chinook salmon DPS escapement 2000 to 2012.

Year	Methow[a]	Entiat[b]	Wenatchee[c]
2000	1,223	175	675
2001	14,532	485	2,607
2002	3,101	370	1,449
2003	1,630	259	545
2004	2,216	302	1,470
2005	2,038	267	1,215
2006	2,479	190	892
2007	1,500	468	1,952
2008	1,445	194	1,838
2009	3,611	368	2,178
2010	3,147	445	1,654
2011	4,106	508	2,898
2012	1,298	566	NA
Average	**3,256**	**354**	**1,614**

Source: SaSI, WDFW 2013.

[a] Includes any naturally spawning spring Chinook and includes the Methow, Twisp, Chewuch and Lost River populations.

[b] Includes any naturally spawning spring Chinook.

[c] Includes any naturally spawning spring Chinook and includes the Little Wenatchee, White River, Chiwawa and Nason populations.

- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

Table 2.2.2.15: Percentage of natural-origin and hatchery-origin spawners in the Upper Columbia River Steelhead DPS.

Year	Wenatchee		Entiat		Methow		Okanogan	
	Natural	Hatchery	Natural	Hatchery	Natural	Hatchery	Natural	Hatchery
2000	32.1%	67.9%	22.0%	78.0%	13.4%	86.6%	7.5%	92.5%
2001	41.9%	58.1%	25.9%	74.1%	10.0%	90.0%	5.5%	94.5%
2002	39.1%	60.9%	33.1%	66.9%	5.7%	94.3%	3.1%	96.9%
2003	33.2%	66.8%	25.7%	74.3%	10.4%	89.6%	5.8%	94.2%
2004	23.7%	76.3%	9.5%	90.5%	12.5%	87.5%	7.0%	93.0%
2005	23.7%	76.3%	12.9%	87.1%	10.3%	89.7%	5.7%	94.3%
2006	42.0%	58.0%	27.7%	72.3%	11.7%	88.3%	6.5%	93.5%
2007	45.5%	54.5%	22.0%	78.0%	11.5%	88.5%	6.2%	93.8%
2008	33.4%	66.6%	44.3%	55.7%	19.9%	80.1%	10.5%	89.5%
2009	41.9%	58.1%	14.7%	85.3%	14.4%	85.6%	7.9%	92.1%
2010	35.1%	64.9%	27.8%	72.2%	9.8%	90.2%	5.4%	94.6%
2011	69.8%	30.2%	34.8%	65.2%	17.9%	82.1%	12.3%	87.7%
2012	NA	NA	NA	NA	14.9%	85.1%	8.4%	91.6%
Average	**38.5%**	**61.5%**	**25.0%**	**75.0%**	**12.5%**	**87.5%**	**7.1%**	**92.9%**

Source: SaSI, WDFW 2013.

Table 2.2.2.16: Percentage of natural-origin and hatchery-origin spawners in the Upper Columbia River Spring Chinook Salmon DPS.

Year	Methow[a]		Entiat		Wenatchee[b]
	Natural	Hatchery	Natural	Hatchery	
2000	12.0%	88.0%	30.9%	69.1%	NA
2001	16.7%	83.3%	69.9%	30.1%	NA
2002	13.1%	86.9%	65.9%	34.1%	NA
2003	5.1%	94.9%	59.8%	40.2%	NA
2004	32.6%	67.4%	47.0%	53.0%	NA
2005	38.3%	61.7%	49.1%	50.9%	NA
2006	18.8%	81.2%	42.1%	57.9%	NA
2007	24.7%	75.3%	44.0%	56.0%	NA
2008	29.7%	70.3%	49.0%	51.0%	NA
2009	21.4%	78.6%	48.9%	51.1%	NA
2010	25.4%	74.6%	75.1%	24.9%	NA
2011	33.1%	66.9%	75.0%	25.0%	NA
2012	15.4%	84.6%	66.1%	33.9%	NA
Average	**22.0%**	**78.0%**	**55.6%**	**44.4%**	**NA**

Source: SaSI, WDFW 2013.

[a] Only includes spring Chinook from the Methow population, does not include the Twisp, Chewuch or Lost River populations.

[b] Hatchery and natural origin spring Chinook break out not available.

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

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

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 for UCR "safety net" programs are taken at Wells Hatchery located on the mainstem Columbia River just below Wells Dam at river mile 515. Beginning in 2014, broodstock for the RSRF segregated, harvest program are also collected at RSRF volunteer trap and by anglers fishing on behalf of WDFW in the vicinity of RSRF. These activities are covered under *Direct Take Permit #1395*. Incidental take are submitted at the end of this HGMP.

Broodstock Program:

Broodstock Collection and Spawning: Broodstock for the Ringold Springs program steelhead are collected at RSRF and at Wells Hatchery. Trapping and collection at Wells Hatchery is limited to three days weekly and 16 hours per day. Up to 290,000 green eggs could be taken for the Ringold Springs program, which would involve approximately 58 females. Mating crosses are hatchery x hatchery (HxH). Direct take for this broodstock operation is not included with this HGMP (see *Direct Take Permit #1395*, FR 02-19431). RSRF traps fall Chinook (September through November) and hatchery steelhead (September through March) that volitionally entered the trap in Spring Creek. All wild (unclipped) steelhead are removed from the trap and are transported by hatchery truck upstream and are released at RKm 579 (12 km upstream of RSRF) to minimize repeat capture. In October/November, RSRF-origin steelhead with a right ventral (RV) fin-clip are "recycled" (i.e. released) into the Columbia River several miles downstream of the hatchery during the peak of the fall fishery to provide additional harvest opportunity.

Broodstock Spawning/Pathology Sampling: Only hatchery-origin steelhead (adipose fin-clip only) are spawned for the Ringold Springs summer steelhead program. After spawning, moribund females or fresh pond mortalities may be kidney/spleen sampled for thorough pathogen screening (*Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington,* WDFW and WWTIT 1998 and updated 2006).

Genetic introgression: The Skamania lower CR "early summer" stock was eliminated from the Ringold Springs program in 1997 and was changed to Upper Columbia River steelhead (Wells) stock. UCR "safety net" fish, which may be transferred to RSRF as fed fry if there are numbers in excess of UCR program needs, are separated from the UCR integrated, conservation fish rearing programs by selecting eggs from the earliest spawning cohorts (HxH crosses only). Ringold Springs steelhead (identified by AD+RV fin-clips) that return to Wells Hatchery are not utilized in the broodstock program at Wells. Radio telemetry data in 2001-2002 indicate that some of the steelhead released into the Columbia River from the RSRF program migrate back to the UCR area. In order to limit this straying, the RSRF program has been maintained at levels below 198,000 (authorized for 180,000 up to +10%) 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 hatchery propagated steelhead in the UCR 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 (see *Section 10 Permit #1395*, FR 02-19431).

Rearing Program:

Operation of Hatchery Facilities: Wells Hatchery fry are transferred to RSRF in late April and are reared until the following April (12 months on-station). Fry produced from eggs taken at RSRF in 2014 and in future years will be ready to be ponded in May. Rearing initially takes place in vinyl-lined above-ground raceways with bird netting until January. Growth is fast with 58-60° F. spring water. Mass-marking (AD+RV) begins in July and is completed in August. The fish are transferred from the vinyl raceways to the 5-acre rearing pond in December/January for the final 3.5 months of rearing. Avian predation can be a serious problem in the rearing pond because it is currently not covered with bird netting to preclude predator access. Methods to deter predation are employed with varying success. WDFW has made assessments and forwarded recommendations of needed capital improvements for future funding. Many capital improvements that will also benefit the steelhead program are proposed under the U.S. Army Corps of Engineers (USACE) expansion of RSRF for John Day/The Dalles fall chinook mitigation production. For example, the vinyl raceways will be demolished and replaced with a sufficient number of modern, concrete raceways to accommodate both fall chinook and steelhead rearing. 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. Fish health-monitoring efforts include fish health examinations and virus sampling, abnormal fish loss investigations, and pre-transfer and pre-liberation inspections. All activities are done in accordance with guidelines developed under the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006). Over the years, rearing densities,

disease prevention and fish health monitoring have greatly improved the health of the programs at Wells and Ringold Springs hatcheries. Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995) 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) 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) Volitional releases from large acclimation ponds can encourage rapid migration rates with approximately 20 RM per day observed in the Cowlitz River (Harza 1999, Snow et al. 2013).
2) Once reaching the Columbia River, studies indicate that fish appear to travel quickly. In the area above RSRF, 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 Springs 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 sub-yearling 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). RSRF steelhead smolts are most likely to prey on emergent, natural-origin URB fall chinook in the lower Hanford Reach---a healthy population that is not listed. Based on stomach fullness, most steelhead smolts do not begin to feed extensively until about a week after release (Cannamela 1993). Recent WDFW research (Sharpe et al. 2008) has shown that the predation risk from hatchery steelhead smolt releases are minimal on smaller prey fish. Based on a study in the Skagit basin, Pflug et al. 2013 showed that hatchery steelhead smolts did not prey on wild steelhead juveniles.

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 River and Snake River 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 Springs 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 (Riley et al. 2004). Keeley and Grant (2001) suggest that the mean prey size for 100-200 mm fl salmonids is between 13-15% of predator body size. 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 DPS and geographically upstream of Mid and Lower Columbia DPSs. Release is from a large 5.0-acre acclimation pond with 3 – 3.5 (early-January to mid-April) months of imprinting of the fish on the unique spring water supply. 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 180,000-198,000 smolts, at an average size of 4.5 fpp (220 mm FL). Fish are released volitionally from mid-April to May 1. At 4.5 fpp, steelhead pose an unknown risk on fish of 72-73 mm FL and smaller as *O. mykiss* smolts are large enough to consume unlisted wild Chinook salmon fry (Pearsons and Fritts 1999). Releases occur in mid-April and could encounter listed chum and Chinook in the Lower Columbia DPS. Studies of chum emigration from Duncan Creek (Bonneville/Washougal Chum) indicate that chum appear to complete emigration by late-April, as 99% of the out-migration had occurred by April 21, 20, and 23, in 2012 through 2014, respectively (**Figure 2.2.3.1**), with peak out-migration in mid-March/early-April at 36-42 mm FL (**Table 2.2.3.1)**.

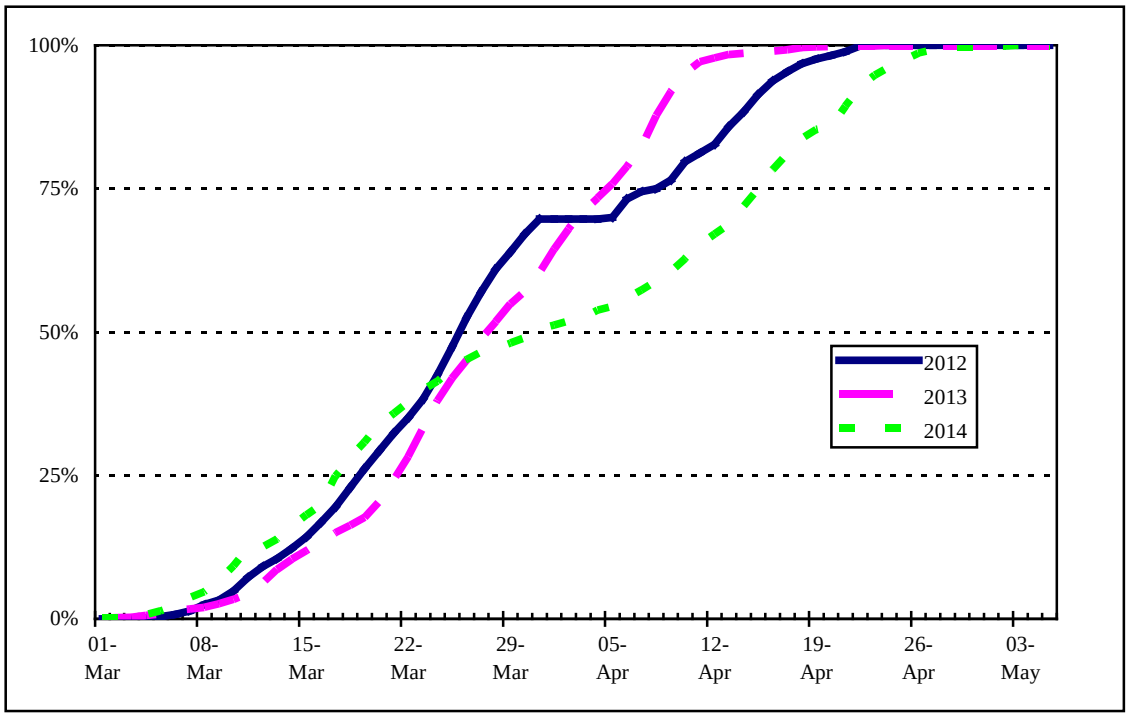

Figure 2.2.3.1: Chum salmon out migration timing at Duncan Creek for brood years 2011-2013. Source: Todd Hillson, WDFW Chum Program, unpublished data.

Table 2.2.3.1: Size range (fork length (mm)) during peak migration timing for juvenile chum salmon captured in out-migrant monitoring traps, Lower Columbia River.

Stream/Trap location	Chum Salmon Juvenile Out-migrants	
	Size Range (mm)	Peak Out-migration Time Frame
Grays River mainstem (2008-12)	36-42	March 19-27
Hamilton Springs Spawning Channel (2011-14)	36-42	March 17-April 8

Source: Todd Hillson, WDFW Chum Program, unpublished data.

Although overlap with listed Chinook occurs, much of the migration of Chinook can occur later in May. Emigration of Chinook in the Lower Columbia River can occur over a broad range from February through August. In small coast stratum tributaries to the main Columbia, Chinook smolt monitoring on Abernathy and Germany Creeks (located at approximately RKm 88.0), indicate early emigration beginning in February and peaking in March (pers. comm. P. Hanratty 2005). Smolt monitoring in Cedar Creek, a tributary to the NF Lewis also indicates early Chinook movement. It is possible that these fish from tributaries reside in the mainstem as other studies indicate peak migration for Chinook is later in spring and mid-summer.

Once in the mainstem corridor, in 1983, peak migration of juvenile salmonids entering the Columbia River Estuary at Jones Beach (RKm 75.0) was reported to be May 7-13 for yearling Chinook, May 14-20 for coho salmon, May 21-27 for steelhead and three peaks for sub-yearling Chinook - May 14-20, June 6-10 and July 2-8 (Dawley 1984).

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 0.90-0.99 K factor and co-efficient of variation (CVs) of less than 10% are the basis of these rearing guidelines. Based on PIT tag studies, successful migrants averaged 227 mm FL (4.1 fpp) indicating selection for larger smolts exists on the Columbia River above Bonneville Dam (Mark

Schuck, WDFW, pers. comm.). 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 (Snow et al. 2013).

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). 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 (plus up to10% = 198,000 max.) steelhead smolts cannot be separated from all other smolt releases, nor can the effects of the entire release be determined at this time. Note from **Table 1.10.1** that since accurate enumeration began in release year 2008 using the impedance counter, the actual release at Ringold has ranged from 134,000 – 186,000 with a six-year average release of 152,000 smolts. Release year 2012 has been the only year RSRF exceeded the 180,000 target and then by only 6,000 or 3.3%. Significant avian predation in the 5-acre pond has reduced net production and the actual release five out of six years. This will likely change in the future once bird netting is installed over the acclimation pond. 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:
See HGMP section 11.

- 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 #s 1395 and 1248.

- 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 broodstock is covered by Permit #1395 at Wells Hatchery. Incidental take during harvest seasons for non-listed game fish species is covered under Permit #1248, and during the Hanford Reach steelhead fishery under Permit #1554.

- 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 #s 1395 and 1248.

3 SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1 Describe alignment of the hatchery program with any DPS-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 4(d) rules which has been agreed to by NOAA for listed steelhead and Chinook in the DPS.

Mitchell Act. This program relies on Mitchell Act Funding. Initially passed in 1938, the Mitchell Act is intended to help rebuild and conserve the fish runs, and mitigate the impacts to fish from water diversions, dams on the mainstem of the Columbia River, pollution and logging. The Mitchell Act specifically directs establishment of salmon hatcheries, conduct of engineering and biological surveys and experiments, and installing fish protective devices. It also authorizes agreements with State fishery agencies and construction of facilities on State-owned lands. NMFS has administered the program as of 1970. There are 15 Mitchell Act hatcheries in Washington State; the majority of which are below Bonneville Dam.

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

The Washington Department of Fish and Wildlife *Statewide Steelhead Management Plan* (*SSMP*): *Statewide Policies, Strategies, and Actions,* (WDFW 2008), was adopted by Washington Fish and Wildlife Commission on March 8, 2008 (available at: http://wdfw.wa.gov/conservation/fisheries/steelhead/management_plan.html). Under this plan segregated harvest programs are to result in an average gene flow of less than 2% from the hatchery to the wild stock for Primary populations, a pHOS of less than 10% for Contributing populations, and to maintain current conditions for Stabilizing populations. In addition, segregated programs will use broodstock that originated from releases of juveniles from that facility or that watershed unless no hatchery or trapping facility exists.

According to the *SSMP*:

> Where risks are inconsistent with watershed goals, one or more of the following actions should be implemented:
>
> - Leave trapping facilities open during the entire return time for adults of the segregated stock (current practice at RSRF).
> - Eliminate recycling of hatchery-origin adults to anadromous waters (Ringold Springs recycles steelhead only at the beginning of the fishing season (October through November) to increase sport harvest. Recycling is discontinued after December 1.
> - Release steelhead juveniles from steelhead programs only at locations where returning adults can be captured (current practice at Ringold Springs).
> - Increase the harvest rates on hatchery-origin fish (intent of recycling at Ringold Springs early in fishing season).
> - Reduce the number of fish released or change the release location, rearing practices affecting the rate of residualism, or other program characteristics to reduce the rate of gene flow.
> - Eliminate the segregated hatchery program.
> - Replace the segregated program with an integrated program with risks that are consistent with watershed goals.

Washington Department of Fish and Wildlife Commission Policy C-3619. WDFW adopted the Hatchery and Fishery Reform Policy C-3619 in 2009. Its purpose is to advance the conservation and recovery of wild salmon and steelhead by promoting and guiding the implementation of hatchery reform. The intent of hatchery reform is to improve hatchery effectiveness, ensure compatibility between hatchery production and salmon recovery plans and rebuilding programs,

and support sustainable fisheries. WDFW Policy C-3619 works to promote the conservation and recovery of wild salmon and steelhead and provide fishery-related benefits by establishing clear goals for each state hatchery, conducting scientifically defensible-operations, and using informed decision making to improve management. It is recognized that many state operated hatcheries are subject to provisions under U.S. v. Washington (1974) and U.S. v. Oregon and that hatchery reform actions must be done in close coordination with tribal co-managers (available at http://wdfw.wa.gov/commission/policies/c3619.html).

Hatchery Reform- Principles and Recommendations of the Hatchery Scientific Review Group: WDFW programs have incorporated the suggestions this report provided, in a detailed description of the HSRG's scientific framework, tools and resources developed for evaluating hatchery programs, the processes used to apply these tools, and the resulting principles, system-wide recommendations, and program-specific recommendations to reform (HSRG 2009) (also see HGMP section 6.2.3).

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

Hatchery salmon and steelhead production levels are detailed in the annual Future Brood Document. The Future Brood Document (FBD) is a pre-season planning document for fish hatchery production in Washington State for the upcoming brood stock collection and fish rearing season (July 1 – June 30).

See also HGMP section 3.1.

The program described in this HGMP is also 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
- Statewide Steelhead Management Plan (2008)

3.3 Relationship to harvest objectives.

Ringold steelhead returns are harvested from the Lower Columbia up to the Old Hanford Townsite Wooden Powerline Towers (RM 362.7), eight miles upstream of Spring Creek (RKm 352), where the smolts are released. The targeted fishery is in the mainstem adjacent to the RSRF area where imprinted fish home to the Ringold Springs creek outlet. A significant bank and boat fishery targets the AD+RV mass marked fish when they return. The bank and boat fishery opens on October 1 by permanent rule and extends until March 31. Bank fishing only on the left bank adjacent to the hatchery continues through April 15 annually. If UCR steelhead management goals for DPS escapement are met before October 1, and steelhead fishing opens above Priest Rapids Dam in September, the Ringold fishery also opens early by emergency rule. Any Ringold Springs steelhead that stray above Priest Rapids Dam can be harvested along with hatchery releases from the upper tributaries. Since 2001, the area from Priest Rapids downstream to the

Hwy-395 Bridge in Pasco has an average annual steelhead catch of nearly 2,600 fish and a harvest of Ringold Springs AD+RV fish of 1,300 (**Table 3.3.1**).

Table 3.3.1: Hanford Reach terminal steelhead sport fishery effort, catch and harvest from creel census

Hanford Reach Steelhead Fishery

	Total			ADRV[1]		AD Only		No Mark (NM)		NM Hatchery		Wild		Recycle[2]		Angler	Sampled		Anglers	Angler
	Catch	Harvest	Released	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	% of Tot	Catch	Harvest	Hours	Hours	%	(sampled)	Trips
2001-02	1,931	1,764	167									167	8.6%			16,648	2,269	13.6%		
2002-03	2,036	1,333	703									212	10.4%			21,633	4,818	22.3%		
2003-04	4,269	2,698	1,571	3,845	2,628	275	70					148	3.5%	105	97	45,070	13,051	29.0%		
2004-05	2,349	1,824	524	2,056	1,691	198	133					95	4.0%	269	263	41,359	13,011	31.5%		
2005-06	1,527	1,069	458	1,240	933	203	135					84	5.5%	8	5	35,148	9,933	28.3%		
2006-07	2,297	1,710	588	1,915	1,534	304	174					83	3.6%	123	123	39,027	10,330	26.5%		
2007-08	2,209	1,315	894	1,486	1,028	480	281					243	11.0%	0	0	33,329	10,233	30.7%		
2008-09	4,015	2,407	1,609	1,467	1,245	2,246	1,161					303	7.5%	0	0	40,842	11,599	28.4%		
2009-10	4,742	3,018	1,723	1,856	1,758	1,458	1,253	1,477	7	1,010	0	466	9.8%	69	69	35,843	9,069	25.3%		
2010-11	1,886	1,330	555	1,196	1,066	302	265	396	0	163	0	224	11.9%	48	48	26,806	7,837	29.2%		
2011-12	3,278	1,512	1,766	2,159	1,334	239	178	879	0	366	0	513	15.7%	18	18	30,588	6,121	20.0%		
2012-13	1,556	802	754	955	761	194	34	372	0	205	0	167	10.7%	47	47	17,476	4,006	22.9%	1,193	5,163
2013-14	1,356	814	542	977	785	60	29	319		99		220	16.2%	8	8	22,001	7,452	33.9%	1,791	5,510
Mean =	**2,573**	**1,661**	**912**	**1,741**	**1,342**	**542**	**338**	**689**	**2**	**369**	**0**	**225**	**9.1%**	**63**	**62**	**31,213**	**8,441**	**26.3%**	**1,492**	**5,336**

Source: Paul Hoffarth, WDFW Dist. 4 Fish Biologist.

Additionally:

- Fisheries in the Columbia River basin are managed subject to provisions of the 2008-2017 *U.S. v Oregon* Management Agreement.
- 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 Hatchery steelhead released from RSRF are covered under the lower Columbia River fisheries ESA Section 7 Biological Opinion which provides ESA coverage up to the old Hanford townsite wooden powerline towers (RM 362.7). WDFW proposes to open a recreational harvest fishery upstream of the wooden powerline towers under the *Upper Columbia River Direct Take Section 10 Permit# 1395* 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 and meeting wild escapement goals to UCR tributaries (WDFW 2002) and when allowable wild steelhead mortalities (i.e. wild impacts) are sufficient to support hatchery steelhead fisheries above and below Priest Rapids Dam.

Incidental harvest of listed UCR steelhead during spring and fall chinook fisheries is covered under Section 7 Permit #1248 currently under renewal.

3.3.1 Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

Mainstem Columbia River hatchery steelhead catch downstream of the Hwy-395 Bridge in Pasco includes large numbers of steelhead destined for upriver locations, including the Snake River and UCR. Harvest data specific to Ringold Springs program is not available except for the terminal fishery in the Hanford Reach monitored by creel census to estimate harvest of AD+RV fish. Ringold Springs steelhead are all mass marked with the AD+RV clip, but do not receive a CWT that would allow estimating contribution to lower river (below the Hwy-395 bridge) tribal or sport fisheries.

3.4 Relationship to habitat protection and recovery strategies.

The Hanford/Columbia River reach is managed at a much larger scale than the sub-basin or province, and within the sub-basin 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 (see also HGMP section 2.1).

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

Sub-basin 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:* Out-migrant hatchery fish can be preyed upon through the entire migration corridor from the river sub-basin to the mainstem Columbia River and estuary. Northern pikeminnow and introduced spiny rays, as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons in the Columbia mainstem sloughs, can prey on steelhead smolts. Mammals that can take a heavy toll on migrating smolts and returning adults include: harbor seals, sea lions, river otters and Southern Resident killer whales.

(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 DPS (threatened); Snake River spring/summer-run Chinook salmon DPS (threatened); Lower Columbia River Chinook salmon DPS (threatened); Upper Columbia River spring-run Chinook salmon DPS (endangered); Columbia River chum salmon DPS (threatened); Snake River sockeye salmon DPS (endangered); Upper Columbia River steelhead DPS (endangered); Snake River Basin steelhead DPS (threatened); Lower Columbia River steelhead DPS (threatened); and the Middle Columbia River steelhead DPS (threatened). Listed fish can be impacted through a complex web of short and long term processes and over multiple time periods which makes evaluation of this a net effect difficult. WDFW is unaware of studies directly evaluating adverse ecological effects to listed salmon.

(3) *Salmonid and non-salmonid fishes or other species that could positively impact the program.* Survival of Ringold Springs steelhead smolts may be positively impacted by the "predation buffering effect" of wild salmonids and non-salmonid fish and by other migrating hatchery salmon and steelhead smolts from upriver hatchery programs that are co-mingled with Ringold Springs steelhead during their downstream migration.

(4) *Salmonid and non-salmonid fishes or species that could be positively impacted by the program.* Nutrients provided by decaying carcasses might benefit fish and aquatic invertebrates in freshwater (Wipfli et al. 1998; Mathisen et al. 1988; Bilby et al. 1996). The program could also positively impact freshwater and marine species that prey on juvenile and adult fish. These species include:

- Northern pikeminnow

- Chinook salmon, steelhead, coastal cutthroat trout
- Pacific staghorn sculpin
- Eulachon
- Numerous marine pelagic fish species
- Avian predators, including: gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons
- Mammals including: harbor seals, sea lions, river otters and Southern Resident killer whales.

4 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.

Table 4.1.1: Water sources available at the Ringold Springs Rearing Facility.

Water Source	Water Right		Available Water Flow	Water Temp. (F°)	Usage	Limitations
	Record/Cert. No.	Permit No.				
Ringold Springs	S3-00408C WRIS	-----	30 cfs	58-60	Broodstock collection, Incubation, Rearing, Acclimation	Cannot be used for holding broodstock; warmer water temperatures can adversely affect gamete viability.
	S3-27815C WRIS	-----	15 cfs			
	S3-27816C	-----	15 cfs			
	S3-283301C	-----	10 cfs			
Columbia River	S3-29444*	-----	10 cfs	38-58	New application (1993)	Not available - water right not issued

Source: Phinney 2006, WDOE Water Resources Explorer 2014, WDFW hatchery data.
* Application number only; no certificate issued.

Surface water rights from the Ringold Springs source, totaling 70 cfs for continuous fish propagation, are formalized through four certificates of water right (**Table 4.1.1**) issued by the Washington Department of Ecology (WDOE) in 1961, 1984, and 1986. Monitoring and measurement of water usage is reported in monthly NPDES reports (**Table 4.1.2**).

Water is supplied by springs located east of the facility which provide gravity-flow, 58-60°F water year-round. Temperatures in the rearing receptacles though, can range from 52°F to 62°F over the year. Juvenile steelhead are initially reared in up to ten 8’x 80’ vinyl raceways that can use up 1,920 gpm (4.3 cfs) each. By December, after mass-marking (AD+RV-clips) is completed, the fish are transferred to the 5-acre earthen bottom rearing pond with an average use of about 2,094 gpm (4.7 cfs). Outflow from the rearing ponds and raceways join un-used spring water to create “Spring Creek,” which flows into the river.

RSRF does not have a water right to the Columbia River. WDFW has an application pending with WDOE (application# S3-29444) since April 1, 1993, for a 10 cfs continuous diversion from January 1 through March 31, annually, to supplement low flow from springs. River diversion is no longer used until the water right is secured.

NPDES permit:
This facility operates and complies with limits under the “Upland Fin-Fish Hatching and Rearing” National pollution Discharge Elimination System (NPDES) administered by the WDOE (see **Table 4.1.1**) 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. RSRF discharges effluent

directly to the Columbia River. This facility meets or exceeds NPDES requirements. Total instantaneous discharge for the facilities is up to 70 cfs. Hatchery effluent from the facilities located on the mainstem Columbia is greatly diluted and will have insignificant effects on out-migrating listed species and their habitat.

Monthly and annual reports on water quality sampling, use of chemicals at this facility, compliance records are available from WDOE.

Discharges from the cleaning treatment system are monitored as follows:

- *Total Suspended Solids (TSS)* 1 to 2 times per month on composite effluent, maximum effluent and influent samples.
- *Settleable Solids (SS)* 1 to 2 times per week on effluent and influent samples.
- *In-hatchery Water Temperature* - daily maximum and minimum readings.

Table 4.1.2: Record of NPDES permit compliance at Ringold Springs Rearing Facility.

Facility	Reports Submitted? Y/N			Last Inspection Date	Violations Last 5 yrs.?	Corrective Actions?Y/N	Meets Compliance?Y/N
	Monthly	Qtrly	Annual				
Ringold WAG13-7009	Y	Y	Y	3/4/2008	0	N	Y

Source: WDFW Hatcheries Headquarters Database 2014.

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.

Listed (or unlisted) fish do not have access and are not found in the upland "Ringold Springs" water source. The four, spring source, hatchery gravity water diversions are not required to be equipped with fish screens.

5 SECTION 5. FACILITIES

5.1 Broodstock collection facilities (or methods).

Wells Dam/Hatchery: The summer steelhead are trapped on both the east and west ladders of Wells Dam. In some years, to meet broodstock needs staff collect adults from the volunteer raceway, which is located below the rearing and adult holding ponds. See also Wells Complex Summer Steelhead HGMP.

Ringold Springs: RSRF began collecting hatchery adults for broodstock in March 2014. Some fish were captured in the volunteer trap; however, most broodstock were captured by volunteer angler broodstock collection (ABC) via hook-and-line, fishing in the Columbia River adjacent to the hatchery. Adults access the trap by moving up Spring Creek (created from the outflow of the RSRF rearing ponds) and through a picket weir (with "V"-notch) into the trapping channel. An upstream picket weir contains the adults. Adults are then 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 Springs marked fish fishery "recycling"), or upriver of Ringold Springs (Upper Columbia Region marked or unmarked fish).

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

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

Table 5.2.1: Transportation equipment available.

Equipment 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 (Wells Hatchery to RSRF)	1500	Y	N	180

5.3 Broodstock holding and spawning facilities.

Wells Hatchery. All brood at Wells Hatchery are held in one pond, through spawning. The water supply can be well water, or a mixture of well and surface water. Temperatures are regulated to remain between 48°F and 54°F.

Table 5.3.1: Broodstock holding and spawning facilities available at Wells Hatchery.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
1	Concrete Adult Holding Pond	1,322.5	23	10	5.75	1,800

See also Wells Complex Summer Steelhead HGMP.

Ringold Springs. Currently, steelhead broodstock cannot be held for extended periods at RSRF because the 58-60°F spring water source is too warm and adversely affects gamete viability. Colder groundwater is not currently available. In 2014, ripe or nearly ripe fish were collected in late-March and spawned immediately or within a week. Fish that were held for a short time were held in a holding area/trapping channel adjacent to the main volunteer trap (see HGMP section 5.1). The in-stream holding area consists of upstream and downstream blocking weirs in Spring Creek, with a downstream "V"-entrance.

5.4 Incubation facilities.

Table 5.4.1: Incubation vessels available.

Location	Incubator Type	Units (number)	Flow (gpm)	Loading-Eyeing (eggs/unit)	Loading-Hatching (eggs/unit)
Wells	Heath Tray	728	na	8,000	8,000
Ringold	Heath Tray	54	3.0	8,000	8,000

See also Wells Complex Summer Steelhead HGMP.

5.5 Rearing facilities.

Steelhead fry are ponded at Wells Hatchery in intermediate deep tanks. When the fish reach 700 fpp, they are transferred to Ringold Springs. At RSRF, emergent fry produced from on-site spawning and incubation are also ponded into deep tanks and/or "Canadians" (shallow troughs) and are reared to 700 fpp. Both groups are transferred into up to ten vinyl raceways reared until they are large enough to be mass-marked in the fall. After marking, fish are returned to the vinyl raceways until they are moved to the 5-acre pond by December or early-January.

Table 5.5.1: Rearing ponds available at Ringold Springs Rearing Facility.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Flow Index	Max. Density Index
14	Vinyl Raceways	1,660	83	8	3.5	373	0.4	0.1
1	Earthen Pond (5.0 acres)	1,673,000	-	-	8.0	2094	2.06-	0.002-

See also Wells Complex Summer Steelhead HGMP.

5.6 Acclimation/release facilities.

Program fish are released from the 5-acre earthen pond. Fish are acclimated on-station at Ringold Springs until mid-April (approximately twelve months rearing/acclimation on the unique spring water supply).

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

In past years, a 40% loss of fish occurred during the period between ponding and the first inventory (at tagging). The average loss post tagging and transfer to the 5-acre pond was 2.6% in 2006, 9.4% in 2007 and 5.9% in 2008, respectively. Heavy losses can also be attributed to bird predation in the 5-acre pond. Documented loss from avian predation during release was 26% in 2008, and 34.6% in 2009. Budgets and funding have limited the ability to appropriately down-size the 5-acre pond and effectively cover with bird netting to prevent these high loses due to bird predation. Losses in 2014 were very low (estimated at 1,500 fish) because of reduced bird density and avian predation control performed under contract by USDA-Wildlife Services staff.

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.

Staff is available 24/7 to respond to any problems with equipment failure or water loss. Aeration pumps are used to maximize the water conditions in the adult collection pond at Wells Hatchery during periods of low water quality, which benefits fish held until sorting can be accomplished.

Fish rearing practices are conducted in compliance with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006) and IHOT (1995) fish health guidelines. WDFW fish health specialists conduct inspections monthly and problems are managed promptly to limit mortality and reduce possible disease transmission. As for the threat of a virus outbreak, we have very strict disinfection procedures and comprehensive lab analysis of all egg takes for culling, if needed.

6 SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1 Source.

Adult hatchery-origin summer steelhead returning to RSRF and Wells Hatchery at Wells Dam. WDFW's preference is to collect and spawn a sufficient number of adults at Ringold to achieve the production objective of 180,000 yearling smolts released without relying on fry transfers from Wells Hatchery. In 2014, the first year in the process to become self-sufficient, Ringold Springs was able to collect enough broodstock on-site (volunteer trap plus volunteer angler-caught fish) to yield 50% of the production objective (90,000). WDFW's intent is to gradually increase the annual broodstock collection until 100 percent of the objective is spawned/incubated on-site.

6.2 Supporting information.

6.2.1 History.

Steelhead have been released from the Ringold Springs Rearing Facility (RSRF) under the then Washington Department of Game (WDG) since 1963. Until the merger into WDFW in 1994, the brood source was mostly early summer steelhead from Skamania Hatchery, except in the early-1980s when IHNV problems at Skamania required using some Wells Hatchery stock. In the 1990s, the program used returns captured at RSRF for holding and spawning; eggs were

transferred to Lyons Ferry for incubation, hatching and early rearing, or to supplement needs for Skamania Hatchery. With UCR steelhead listings in 1997, the program changed to Wells Hatchery stock in 1997 with the first return of 1-salt adults in 1999.

Table 6.2.1.1: Source of broodstock used for Ringold Springs summer steelhead program.

Broodstock Source	Origin	Year(s) Used	
		Begin	End
Skamania Hatchery Stock	H	1963	1980
Wells Hatchery Stock	H	1981	1983
Skamania Hatchery Stock (Ringold Springs)	H	1987	1996
Wells Hatchery Stock	H	1997	Present

6.2.2 Annual size.

In recent years, the adult run return past Wells Dam ranges from 1,472 (1993) to 27,734 (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.

Table 6.2.2.1: In-season hatchery escapement and total egg take of summer steelhead broodstock, Wells Dam traps*.

Year	Number Trapped		Egg-Take		
	Total	Spawned	Begin	End	Total
2005-2006	1,305	373	01/04/06	04/11/06	1,238,431
2006-2007	393	365	12/20/06	04/25/07	383,294
2007-2008	379	350	12/26/07	04/16/08	995.000
2008-2009	980	301	12/28/08	04/28/09	828,500
2009-2010	1,284	302	01/13/10	05/05/10	916,111
2010-2011	1,374	314	01/05/11	05/04/11	910,592
2011-2012	623	330	12/27/11	05/01/12	1,031,603
2012-2013	576	282	01/08/13	04/30/13	842,716
2013-2014	561	228	12/30/13	05/06/14	671,000

Source: WDFW In-Season Hatchery Escapement Weekly Report.
* Totals include egg-take for Eastbank Hatchery (through 2009) and Omak Hatchery (through 2011).

Table 6.2.2.2: In-season hatchery escapement and total egg take of summer steelhead broodstock at RSRF.

Year	Trapped & ABC Program		Egg Take		
	Total	Spawned	Begin	End	Total
2013-14	489	60	3/26/14	4/8/14	190,424

Source: WDFW In-Season Hatchery Escapement Weekly Reports.

6.2.3 Past and proposed level of natural fish in broodstock.

No natural-origin fish are taken for broodstock at Ringold Springs.

6.2.4 Genetic or ecological differences.

The Ringold Springs fish are considered to be a "reserve source" if catastrophic loss in the Upper Columbia jeopardizes the population. They are progeny of UCR stock although the spawner cohorts are primarily HxH crosses from the Wells Hatchery program.

The juveniles are released as standard hatchery age-1+ smolts at the lower-most extent of the Upper Columbia Steelhead DPS.

6.2.5 Reasons for choosing.

A switch from early summer steelhead stock collected at Skamania Hatchery to locally adapted Wells Hatchery stock was facilitated in order to eliminate any potential impacts from an out of basin stock to ESA-listed UCR 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 RSRF. The transition to on-site broodstock collection at Ringold Springs will improve the level of segregation from the UCR wild stocks and integrated hatchery programs.
- Hatchery-origin Wells summer steelhead are trapped at the Wells Dam east and west ladders. Adult collection at the dam occurs three 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% of the run.
- Returning Ringold Springs summer steelhead, if any stray upriver to Wells Hatchery, are selectively excluded from the broodstock collection and can be identified by the adipose + right ventral fin-clips (AD+RV). Ringold Springs AD+RV fish and AD-only hatchery steelhead from the Upper Columbia River are collected for broodstock at RSRF from the volunteer trap and from the volunteer angler collection program.

7 SECTION 7. BROODSTOCK COLLECTION

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

Adult steelhead collected at the Wells Dam fish ladder and trapping facility and, beginning in 2014, at the Ringold Springs creek volunteer trap and the Columbia River adjacent to RSRF.

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 UCR steelhead are impacted as trapping is limited to three days weekly per Section 10 Permit #1395. Ringold Springs-origin steelhead adults that enter the trap at Wells Dam can be identified by a RV-clip and are not used in the spawning protocol at Wells. These fish can be passed upstream to contribute to sport fishery harvest.

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

At RSRF, any hatchery steelhead entering the volunteer trap in late-March/early-April that is mature and ready to spawn is used to produce a portion of the program. In addition, a volunteer angler broodstock collection (ABC) program targeting fish holding in the Columbia River adjacent to RSRF will be utilized to supplement trap captures.

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 DPS 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 Springs program to provide harvest, and reduce genetic impacts to the UCR DPS. At Wells Hatchery adults are held on well water with the early segment (the portion of the broodstock used to provide fry for the Ringold Springs program) spawning in December, with the later spawning component used for the UCR recovery program continuing until March with natural spawning occurring 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 58 pairs of spawners depending on fecundity are needed for the Ringold program.

7.4.2 Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

The first Wells Hatchery adults spawned for eggs used in the Ringold Springs program began in 1997.

Table 7.4.2.1: Total adult (hatchery and wild origin) spawners returning to Wells Hatchery.

Brood Year	Males	Females	Total
2003	187	250	437
2004	288	268	556
2005	246	313	559
2006	234	302	536
2007	209	287	496
2008	169	181	350
2009	146	151	297
2010	177	157	334
2011	149	172	321
2012	123	146	269
2013	75	150	225
2014	116	122	238
Average	**177**	**208**	**385**

Source: WDFW Hatcheries Headquarters Database 2014.

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

Wells Hatchery: All hatchery-origin steelhead not used for propagation or studies are released to the Upper Columbia for harvest opportunity.

Ringold Springs: Beginning in 2014, WDFW uses all hatchery-origin steelhead captured in the RSRF ladder/trap in March and early April for Ringold Springs program broodstock. In the fall (October – November) at the beginning of the return Ringold Springs program fish identified by the AD+RV fin-clips are recycled back to Pasco (downstream of release site) for additional sport opportunity.

7.6 Fish transportation and holding methods.

A tanker is available for harvest recycling. No broodstock are transported to or from the Wells Hatchery for the Ringold Springs program. Hatchery-origin broodstock collected in the RSRF volunteer trap or hook-and-line captured by volunteer anglers are graded for maturity and are spawned immediately or are held in the trap for up to a week before spawning.

7.7 Describe fish health maintenance and sanitation procedures applied.

See Wells Complex Summer Steelhead HGMP.

7.8 Disposition of carcasses.

Adult broodstock carcasses are disposed of accordance with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated in 2006), Integrated Hatchery Operations Team (IHOT). See also Wells Complex Summer Steelhead HGMP.

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.

Returns to Ringold Springs Trap: From October 1 through October 31, natural-origin UCR steelhead (intact adipose fin) and UCR hatchery steelhead, identified with adipose clip -only are transported and released into the Columbia mainstem approximately 4-miles upstream of RSRF at "Parking Lot #7 (RM 361.8). Beginning November 1, only natural-origin steelhead are transported upstream, while all hatchery steelhead identified with adipose clip-only and Ringold Springs-origin Ad+RV fin-clips are transported downstream and recycled to benefit the fishery.

8 SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

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 identified by origin (natural versus hatchery) in order to implement selective mating of WxH and HxH crosses. The Ringold Springs summer steelhead program is provided HxH crosses only. Only hatchery-origin fish are collected for broodstock (HxH) at RSRF.

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 stock 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 HxH and HxW portions are documented for the various programs at Wells Hatchery.

9 SECTION 9. INCUBATION AND REARING

Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1 Incubation:

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

Table 9.1.1.1: Survival rates from egg-take to ponding, Ringold Springs Hatchery summer steelhead program, 2008-2014[a].

Brood Year		Egg-Take	Green-Eyed Survival (%)	Eyed-Ponding Survival (%)	Fingerling-Smolt Survival (%)
2008		687,950	86.1	97.4	66.75
2009		830,500	86.2	87.9	77.6
2010		863,500	84.8	68	74.7
2011		910,592	85.9	74.1	79.1
2012		799,000	85.7	57.4	84.4
2013		671,000	84.1	62.5	59.4
2014	**Wells**	671,000	76.2	84.7	TBD
	Ringold[b]	190,424	91.7	50.5	TBD

Source: WDFW Hatcheries Headquarters Database, WDFW hatchery records, 2014.
[a] Data prior to brood year 2008 included egg-takes for Omak and Eastbank hatcheries steelhead programs.
[b] Egg-takes occurred for the first time at RSRF in 2014.

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 Hatchery. The permit limits production at Ringold Springs to 180,000 fish; therefore, based on green egg-to-smolt loss, a maximum of 250,000 fed fry at 700 fpp are transferred to the Ringold Springs Rearing Facility (RSRF). The number of Wells Hatchery fry to be transferred will decrease over time as on-site broodstock collection and spawning at RSRF produces a larger percentage of the Ringold Springs program fry needs. In 2014, 89,600 fry (36% of target production) were produced on-site. Wells Hatchery has shipped 43,300 fry to Ringold Springs as of October 10, 2014 (17%); more fingerlings are expected to be shipped from Wells Hatchery, but the brood year 2014 total will fall short of the 250,000 fry/180,000 smolt program objective.

9.1.3 Loading densities applied during incubation.

Steelhead eggs range in size from 2,800 eggs/lbs. to 3,000 eggs/lb (see Wells Complex Summer Steelhead HGMP).

9.1.4 Incubation conditions.

Egg incubation (fertilized to eyed stage) occurs at Wells Hatchery and also at RSRF beginning in 2014. Disinfection procedures are implemented during incubation that prevents pathogen transmission between stocks of fish on site (see Wells Complex Summer Steelhead HGMP).

9.1.5 Ponding.

Fry are typically ponded from vertical incubation trays into deep tanks or troughs once buttoned up or ready to start feeding. Fry typically start feeding at approximately 3,000 fish per pound.

9.1.6 Fish health maintenance and monitoring.

During egg incubation, chillers are utilized and maintained by staff for optimum temperature range of 52-54° F. Eggs are treated each day up until just prior to hatch with formalin to prevent *Saprolegnia* (fungus disease). Once eye-up occurs, eggs are shocked and picked and chillers are no longer utilized. Eyed eggs are switched to the ambient spring water source of 59° F.

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.

Not applicable at Ringold Springs.

9.2 Rearing:

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, or for years dependable data are available.

See HGMP section 9.1.1.

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

Ringold Springs. Fish are reared up to 0.33 lbs fish/ft^3 (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/ft^3 at release.

9.2.3 Fish rearing conditions.

Fish are ponded and started at Wells Hatchery in intermediate deep tanks and are reared until early spring. When fish are approximately 700 fpp, they are transferred to the RSRF.

Once at RSRF, they are placed in up to ten 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 three 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.

Table 9.2.3.1: Monthly average surface water temperature (^{o}F) at Ringold Springs Rearing Facility.

Month	Average Water Temperature (^{o}F)
January	59
February	59
March	59
April	59
May	59
June	60
July	60
August	60
September	60
October	59

November	59
December	59

Source: WDFW hatchery records.

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.

Table 9.2.4.1: Average size (fpp), by month, of juvenile summer steelhead reared Wells Hatchery and RSRF.

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	13.70	0.95
November	130	21.60	0.98
December	144	28.40	0.95
January	169	45.36	0.94
February	184	59.68	0.96
March	215	92.57	0.93
April	233	113.00	0.93

Source: WDFW hatchery records.

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

See **Table 9.2.4.1**.

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).

Fish are started with various brands of starter feed, and are gradually increased on feed size to crumbles and pellets as fish increase in size; the food brand used may vary, depending on cost and vendor contacts.

Fry/fingerling will be fed an appropriate commercial trout/salmon diet. Early stage feeding occurs several times daily as necessary to provide the diet at a range of 2.0-3.0% body weight/day. Feed conversion is expected to fall in a range of 0.85-1.0 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 (CVs) in size of juveniles within the supplemented population. As larger fish, feeding intervals and rate are reduced.

Table 9.2.6.1: Feed application schedule, feeding range, and food conversion, by month

Rearing Period	Application Schedule (#feedings/day)	Feeding Rate Range (%B.W./day)	Lbs. Fed Per gpm of Inflow	Food Conversion During Period
April	6	2.25-3.0	-	0.5
May-Jul	6	1.75-2.25	-	0.5
Aug-Nov	1-2	1.5-1.75	-	0.8
Dec-Feb	1-2	0.75-1.5	-	0.8

Feb-Apr	1-2	0.5-1.2	-	0.8

Source: WDFW hatchery records.

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

Fish health is monitored on a daily basis by the hatchery staff and at least monthly by a state Fish Health Specialist (FHS). Hatchery personnel carry out treatments prescribed by the FHS. Procedures are consistent with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006). See also HGMP section 10.9 for WDFW Standard Fish Health Procedures.

Monitoring: A Fish Health Specialist inspects fish monthly at RSRF 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 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 (Tipping 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 provides the program interaction to some natural food sources, e.g. aquatic insects and 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.

This production is managed as a segregated, harvest program. UCR wild x wild (WxW) and wild x hatchery (WxH) crosses are not included in the hatchery broodstock and are not reared or released through this hatchery program. Only early-timed HxH crosses from Wells Hatchery or HxH crosses returning to Ringold Springs (volunteer trap or from hook-and-line captures in the Columbia River adjacent to the hatchery) are utilized for broodstock.

Hatchery fish are reared to meet *Statewide Steelhead Rearing and Release Guidelines* (Tipping 2001) to achieve a size and condition factor at a time of releases that represents the best chance

for survival in order to meet adult goals. Rearing fish to a yearling smolt stage is mandatory in order to foster out migration and subsequent survival when the fish vacate the system. Fry or sub-yearlings stage would not be reared and released from this program in order to eliminate and minimize interaction with listed fish rearing in the system.

All reasonable and prudent measures are employed to minimize rearing and incubation losses. These include the use of high quality or well water for incubation, high quality feeds for rearing, rearing densities and loadings that conform to best management practices, frequent fish health inspections and presence of professionally trained personnel to operate facilities. Hatcheries are designed to provide a safe and secure rearing environment through the use of alarm systems, backup generators, and water re-use pumping systems to prevent catastrophic fish losses.

10 SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

10.1 Proposed fish release levels.

Target production of 180,000 yearling smolts, plus up to 10%, for a maximum release of 198,000 smolts approved under the *U.S. v Oregon* 2008-17 Management Agreement, Table B6.

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

Stream, river, or watercourse: Spring Creek/Tributary to Columbia River
Release point: 567 RKm
Major watershed: Upper-Middle Columbia River
Basin or Region: Columbia Plateau

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

Table 10.3.1: Number, release data, and size of summer steelhead released from Ringold Springs, 1996-2014.

Release Year	Yearling Release		
	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
2005	80,520	Apr 11-15	5.7
2006	265,328	Apr 17-24	5.6
2007	258,200	Apr 9-30	6.7
2008	134,164	Apr 14-28	5.2
2009	140,047	Apr 14-23	4.2
2010	137,051	Apr 7-15	4.1
2011	144,438	Apr 14-21	4.5
2012	186,143	Apr 12-19	5.0
2013	169,469	Apr 12-22	4.5
2014	142,991	Apr 10-19	4.9
Average	**168,323**		**4.8**

Source: WDFW Hatchery Headquarters Database 2014.

10.4 Actual dates of release and description of release protocols.

A volitional release is planned for mid-April. Actual dates of release are shown in **Table 10.3.1**. 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 the 5-acre rearing pond at RSRF. Rearing has occurred for approximately twelve months on RSRF water, to provide acclimation to the chemistry and temperature regime of Spring Creek.

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

Fish are 100% adipose + right ventral fin-clipped (AD+RV). The AD+RV mark is used to ensure that harvest of Ringold Springs fish can continue independent of Upper Columbia steelhead fishery status. The double fin-clip also excludes Ringold Springs fish from the broodstock selection at Wells Hatchery and monitors any Ringold Springs 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 and *U.S. v Oregon* hatchery production agreements. Also, depending on the amount of broodstock at Wells Hatchery, the Ringold Springs program is the lowest priority for receiving HxH fry from Wells Hatchery, hence the shift to collecting hatchery-origin broodstock at RSRF to meet program goals.

10.9 Fish health certification procedures applied pre-release.

Standard Fish Health Procedures performed at the facility:

- *All fish health monitoring is conducted by a qualified WDFW Fish Health Specialist.*
- *Juvenile fish examinations are conducted at least monthly and more often if necessary*. A representative sample (at the discretion of the fish health specialist) of healthy and moribund fish from each lot is examined.
- *Abnormal levels of fish loss are investigated if they occur.*
- *Fish health status is determined prior to release or transfer to another facility*. The exam may occur during the regular monthly monitoring visit, i.e. within one month of release or transfer.
- *Appropriate actions, including drug or chemical treatments are recommended as necessary*. If a bacterial pathogen requires treatment with antibiotics a drug sensitivity profile is be generated when possible.
- *Findings and results of fish health monitoring are recorded on a standard fish health reporting form and maintained in a fish health database.*

- *Fish culture practices are reviewed as necessary with facility personnel*. Where pertinent; nutrition, water flow and chemistry, loading and density indices, handling, disinfecting procedures and treatments are discussed.

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

Ringold Springs. 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 source is gravity fed, loss of water outside of intake screen plugging is not a problem. RSRF is not susceptible to flooding from the Columbia River.

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

- Release is capped at the number that meets Section 10 permit guidelines for the UCR DPS.
- Program release is consistent with WDFW *Statewide Steelhead Interim Rearing and Release Guidelines* (Tipping 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 maximum CV of 10% (fork length), will be used to indicate when steelhead smolts 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.
- If 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.

11 SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

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

- Continue to monitor catch and harvest of steelhead at Ringold Springs Rearing Facility (RSRF) and in the lower Hanford Reach based on creel census.

- Evaluate feasibility of PIT-tagging a sufficient percentage of Ringold Springs smolt production to allow determination of adult return stray rate to other river systems/wild populations such as the Yakima, Umatilla, Wenatchee and Snake basins and key spawning tributaries where PIT-tag antennae arrays have been deployed. This would provide a method to verify Ringold-specific pHOS estimates for wild, listed populations.
- Adhere to NMFS Section 10 Direct and Indirect permits.
- Continue to mark AD+RV fin-clips for visual identification of Ringold Springs program steelhead.
- 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.

Funding and staff support are available to implement the M&E program described above.

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.

12 SECTION 12. RESEARCH

12.1 Objective or purpose.

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.

Not applicable.

12.3 Principle investigator or project supervisor and staff.

Not applicable.

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

Not applicable.

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

Not applicable.

12.6 Dates or time period in which research activity occurs.

Not applicable.

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

Not applicable.

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

Not applicable.

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

Not applicable.

12.10 Alternative methods to achieve project objectives.

Not applicable.

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

Not applicable.

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.

Not applicable.

13 SECTION 13. ATTACHMENTS AND CITATIONS

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14 SECTION 14. 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:_____

15 ADDENDUM A. PROGRAM EFFECTS ON OTHER (AQUATIC OR TERRESTRIAL) ESA-LISTED POPULATIONS. (Anadromous salmonid effects are addressed in Section 2)

15.1 List all ESA permits or authorizations for USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species associated with the hatchery program.

The WDFW and the USFWS have a Cooperative Agreement pursuant to section 6(c) of the Endangered Species Act that covers the majority of the WDFW actions, including hatchery operations.

> *"The department is authorized by the USFWS for certain activities that may result in the take of bull trout, including salmon/steelhead hatchery broodstocking, hatchery monitoring and evaluation activities and conservation activities such as adult traps, juvenile monitoring, spawning ground surveys..."*

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

Columbia Basin DPS Bull Trout *(Salvelinus confluentus*). Bull trout were listed as threatened in June 1998 (63 FR: 31647-31674). Critical habitat was designated in 2005 (70 FR 56211 56311). A recovery plan was drafted in 2005 and has not been finalized. A 5-year review was finalized in 2008. In January 2010, the USFWS proposed a revision of critical habitat.

Status: The Columbia River DPS occurs throughout the entire Columbia River basin within the United States and its tributaries. The Columbia River population segment is composed of 141 subpopulations.

The Middle Columbia Recovery (MCR) Unit encompasses the Yakima River basin to the confluence with the Columbia River. The Yakima River basin is located in south central Washington, draining approximately 6,155 square miles. It is bounded on the west by the Cascade Range, on the north by the Wenatchee Mountains, on the east by the Rattlesnake Hills, and on the south by the Horse Heaven Hills. The entire basin lies within areas either ceded to the United States by the Yakama Nation or areas reserved for their use. The MCR Team identified a single core area encompassing the Yakima River basin and includes 13 extant local populations, with the mainstem Columbia River considered to contain core habitat which may be important for full recovery to occur. Local populations that are considered essential for recovery include: Ahtanum (including North, South, and Middle forks), Upper Yakima mainstem (Keechelus to Easton), Rattlesnake Creek, North Fork Teanaway River, Upper Cle Elum River, American River, Crow Creek, South Fork Tieton River, Indian Creek, Deep Creek, Box Canyon Creek, Upper Kachess River (including Mineral Creek), and Gold Creek. In addition to the aforementioned local populations, bull trout should be established in the Middle Fork Teanaway River, Taneum Creek, and the North Fork Tieton River.

The Upper Columbia Recovery (UCR) Unit Team identified three core areas including the mainstem and tributaries of the Wenatchee, Entiat, and Methow Rivers. The 16 identified local populations are currently distributed within the Wenatchee (6), Entiat (2) and Methow (8) core areas and are comprised of the migratory life-history form.

Changes in the Status of the Columbia River Interim Recovery: The overall status of the Columbia River interim recovery unit has not changed appreciably since its listing on June 10, 1998. Populations of bull trout and their habitat in this area have been affected by a number to actions addressed under Section 7 of the ESA. Most of these actions resulted in degradation of the environmental baseline of bull trout habitat, and all permitted or analyzed the potential for incidental take of bull trout. The Plum Creek Cascades HCP, Plum Creek

Native Fish HCP, and Forest Practices HCP addressed portions of the Columbia River population of bull trout.

15.3 Analyze effects

Information below is taken from:

15.4 Actions taken to minimize potential effects.

See HGMP section 15.1.

The Hatchery and Supplementation Plan will include measures to minimize the potential negative impacts of hatchery fish on bull trout and other ESA-listed species (SA 8.2.2.10).

15.5 References

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