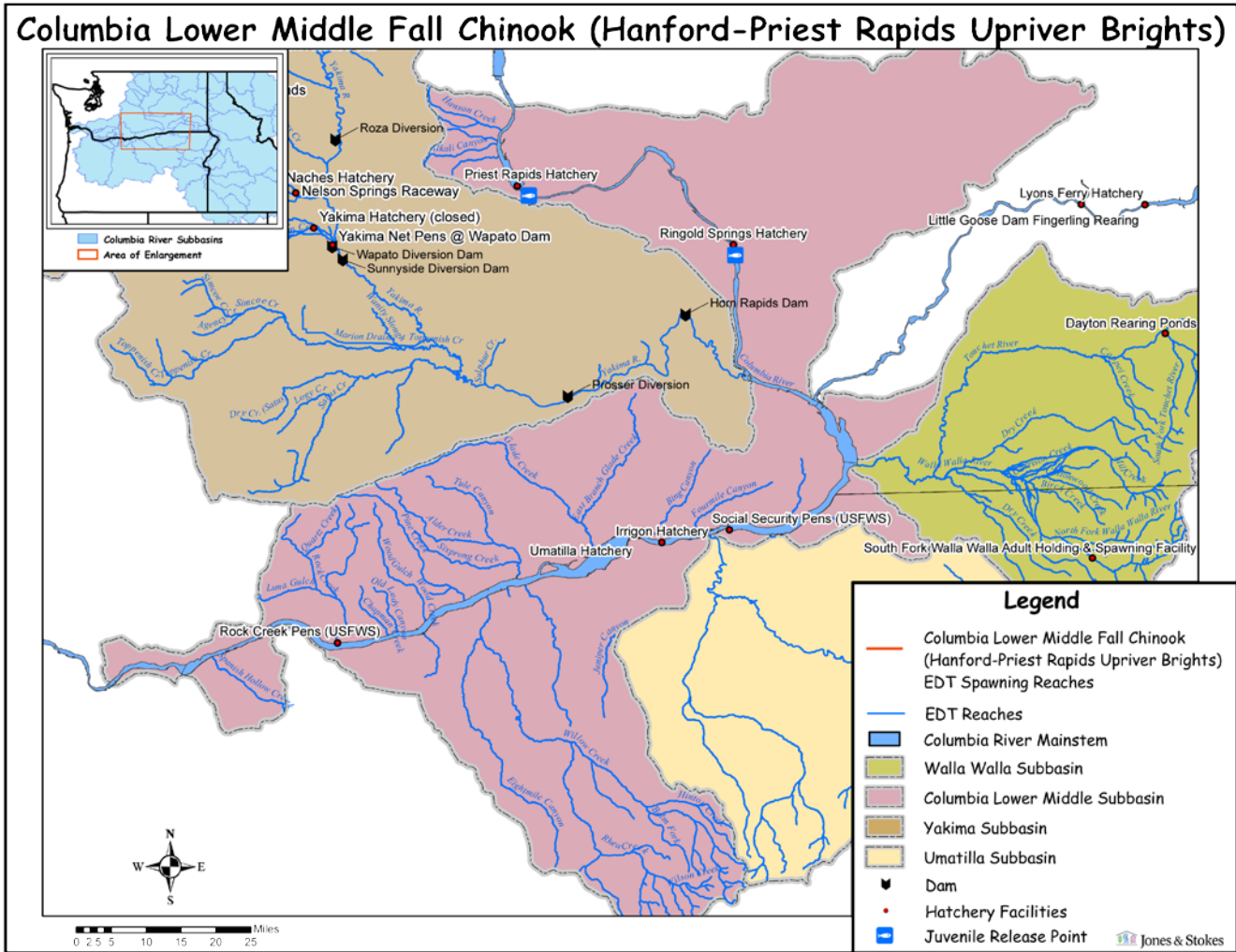


# Hatchery Scientific Review Group Review and Recommendations

## Hanford Reach Fall Chinook Population and Related Hatchery Programs

January 31, 2009



# 1 Columbia Middle Mainstem (Hanford Reach and Priest Rapids) Fall Chinook

The Columbia River Upriver Bright (URB) stock is defined as wild and hatchery fall Chinook originating upstream of McNary Dam (All-Species Review 1996). The URBs are major contributors to ocean fisheries, and are an escapement indicator stock/ model stock to the Chinook Technical Committee (CTC) of the Pacific Salmon Commission. Hanford Reach URBs are one of few Columbia River salmon stocks that currently are not in decline; they are classified as strong by Nehlsen et al. (1991) and healthy by Huntington et al. (1996) and WDFW (1993).

An average of 38,000 Hanford fall Chinook adults spawned naturally from 1994 to 2001. Evenson et al. (2002) estimated that Priest Rapids Hatchery adults comprised an average of 8.6% of this escapement (range of 1.3% to 33.1% for a 20-year period), resulting in a natural-origin spawning escapement of approximately 34,000 adults for approximately the same period. This estimate did not attempt to account for hatchery fish released from the Yakima, Ringold or Umatilla programs and spawning naturally in the Hanford Reach.

## 2 Current Conditions

### 2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Hanford Reach Chinook are part of the Upper Columbia River Fall-run ESU Chinook Salmon; this ESU is not listed.
- Population Designation: Primary - using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette.
- Current Viability Rating: Unknown.
- Recovery Goal for Abundance: NA.
- Productivity Improvement Expectation: None
- Habitat Productivity and Capacity (from EDT): Productivity: 9.0; Capacity: 150,000 (based on professional judgment – no EDT estimates were available).

### 2.2 Current Hatchery Programs Affecting this Population

Two fall Chinook hatchery programs are operating in the Hanford Reach of the Columbia River. The Priest Rapids program is an integrated release of 6.7 million. Another 3.5 million are released from the Ringold Hatchery using juveniles from Bonneville Hatchery.

Priest Rapids Hatchery Fall Chinook- The Priest Rapids Hatchery (WDFW and Grant County PUD) was built in 1963 to mitigate for the Priest Rapids and Wanapum dams. The hatchery program is integrated with the last remaining mainstem natural population (Hanford Reach fall Chinook). The number of natural-origin fall Chinook trapped and used in the broodstock each year is unknown (personal communication, J. Sneva and B. Foster, WDFW; 2005 HGMP), but is thought to be low due to the location of the trap high in the outlet channel, and the use of well water to supply the channel to attract hatchery-produced adult fish.

The purpose of the Priest Rapids Hatchery program is to mitigate for the loss of fall-run Chinook salmon adults that would have been produced in the region in the absence of the Priest Rapids

Project. Additional fall Chinook sub-yearlings are also produced as partial mitigation for John Day Dam, which is funded from sources other than the Mid-Columbia Mitigation and Compensation Plan.

The production release goal is 5.0 million for Priest Rapids and another 1.7 million for the John Day mitigation. Average release from Priest Rapids has been 6.6 million sub-yearling Chinook at approximately 50 fish per pound. Fish are released on-station from early to late June. Annually, 3% of the 5.0 million release is adipose fin-clipped and coded-wire tagged (200,000 fish). The 1.7 million released for the John Day mitigation is 100% adipose fin-clipped.

Survival has averaged 0.4% for brood years 1990 to 1998, with a range of 0.03 to 0.89%.

Broodstock is collected at the Priest Rapids Trap. Annually, approximately 3,100 females are collected. Average fecundity has been 4,404 eggs. The 2005 HGMP reported mating protocols of 1:1 male to female ratio when less than 1 million eggs are collected in a day. On days when more than 1 million eggs are collected, the mating will not be less than 1:3 males to females. The actual ratio of males to females has averaged 1 male to 2 females for 2000 to 2004. Jacks make up 3% of the males.

The percent of Priest Rapids hatchery-origin Chinook in the total Hanford Reach escapement averaged 8.6% from 1979 to 2001 (Evenson et al. 2003). This estimate does not include strays from other nearby hatchery programs (Yakima, Ringold, and Umatilla).

Ringold Hatchery Fall Chinook - The Ringold fall Chinook program is segregated harvest program based on Bonneville Hatchery URBs. The program objective is to replace losses of wild URB Chinook that contribute to treaty Indian and non-Indian sport and commercial fisheries resulting from the federal Columbia River hydropower system and habitat degradation in the Columbia River Basin.

Initially built as part of the Columbia River Fisheries Development Program, Ringold Springs was originally used in conjunction with Lyons Ferry Fish Hatchery as part of the Lower Snake River Compensation Plan (LSRCP) to rear 1.1 million spring Chinook salmon. Funding was provided by NOAA Fisheries via the annual Mitchell Act budget for Columbia River hatchery fish production. In 1997, a cooperative agreement between the Army Corps of Engineers, the Washington State Department of Fish and Wildlife, NOAA Fisheries and the Bureau of Reclamation was reached to share the facilities at Ringold Springs Hatchery for the benefit of the URB fall Chinook salmon (John Day mitigation) at Bonneville Hatchery. The first year of release of URB fall Chinook from Ringold Springs for this revised program was in 1997.

No adult spawning or incubation is currently possible at this facility due to high water temperatures; therefore, operations depend upon other hatcheries for egg take and early rearing. Broodstock for this program are collected at ODFW's Bonneville Hatchery. Initially the preferred broodstock source was Hanford Reach adults; however, this was switched to Bonneville Hatchery. The HGMP provides no reason for the switch. The URB stock was selected because it has characteristics (primarily late maturation) that are more desirable for Columbia River fisheries than Lower Columbia River tule stocks.

Fish are transferred from Bonneville Hatchery and acclimated for 30 to 45 days prior to release from Ringold Springs. From 1998 to 2004, actual releases have averaged 3.1 million sub-yearling fish at 40 to 60 fish per pound. Currently, all fish released from Ringold are adipose fin-clipped.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 4,518 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 2,627 fish

### 3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

#### 3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.1 to 4.0. Average abundance of natural-origin spawners (NOS) would increase from 32,401 to 55,950. Harvest contribution of the natural and hatchery populations would go from 71,582 to 75,586.

#### 3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

### **Observations**

This is the most abundant population in the Columbia River Basin and supports important state and tribal fisheries. The purpose of the hatchery programs in the Hanford Reach (Priest Rapids and Ringold Springs) is to provide harvest. Currently fish are not externally marked.

Adult collection potential at Ringold is limited by shallow depth of flow across the alluvial fan at the mouth of Spring Creek, which inhibits adult fall Chinook migration into the Ringold trap. The history of avian predation and disease also inhibits salmon production. Continued use of the Ringold facilities would require extensive renovations.

Well water supply at the Priest Rapids facility is limited for fish rearing, although not for fish incubation.

Because of the inability to manage the contribution of hatchery fish to spawning consistent with guidelines for a Primary population, segregated hatchery programs of sufficient size to meet program goals are not feasible.

Given the estimates of natural adult contribution to the hatchery broodstock and the contribution of hatchery fish to natural spawning, the existing programs do not meet the PNI standards for a Primary population. Under current harvest and habitat conditions, an integrated program of approximately 10 million could be operated and meet the standards of a Primary population, if 50% of the returning hatchery fish are recaptured at the hatchery and if 50% of the broodstock can be collected from natural-origin adults (resulting in a PNI greater than 0.67). The ability to expand this program significantly and achieve the standards of a primary population would require greater differential harvest and/or increased access to natural spawners for broodstock.

Because of the productivity and abundance of the natural population, there is significant flexibility in sizing an integrated hatchery program.

### **Recommendations**

Move all fall Chinook hatchery production from Ringold to Priest Rapids Hatchery, where the capability to collect a higher proportion of returning hatchery adults exists and where significant increases in production may be possible.

Terminate importation of all fish from outside of the Hanford Reach (such as the Bonneville Hatchery URBs). Adipose-clip all hatchery fish released to allow for broodstock management at Priest Rapids and assessment of hatchery fish spawning naturally. Coded-wire tag a portion of the release to evaluate straying and harvest contributions.

Because the abundance and the productivity of this population are so important to the viability of this ESU and the harvest goals in the basin, this population should be managed to meet the highest conservation standards. Composition on the spawning ground and the hatchery broodstock should be managed consistent with conservation goals for this population. The PNI should be greater than 0.67 and pHOS as low as possible.

Any future expansion of the fall Chinook program should focus on the Priest Rapids facility rather than the Ringold facility.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

Table 1. Results of HSRG analysis of current condition and HSRG Solution for Hanford Reach Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

Alternative	Type and Purpose	Prog Size (/1000)	HOR Recapture	Additional Weir Efficiency	Effective pHOS	PNI	NOS Esc	Adj Prod	Harvest	Hatchery Surplus
Current	Int Harv	6,691.2	75%	0%	15%	0.12	32,401	2.1	65,724	10,219
	URB-Ringold-HatcherySeg Harv	3,499.5	23%						5,858	859
No Hatchery	None None	-	0%	0%	0%	1.00	55,950	4.0	75,586	-
HSRG Solution	Int Harv	10,218.5	50%	0%	18%	0.73	49,933	3.5	104,352	11,201
	URB-Ringold-HatcherySeg Harv	-	70%						-	-
HSRG Solution w/ Improved Habitat	Int Harv	10,218.5	50%	0%	16%	0.75	57,500	3.9	114,576	11,201
	URB-Ringold-HatcherySeg Harv	-	70%						-	-