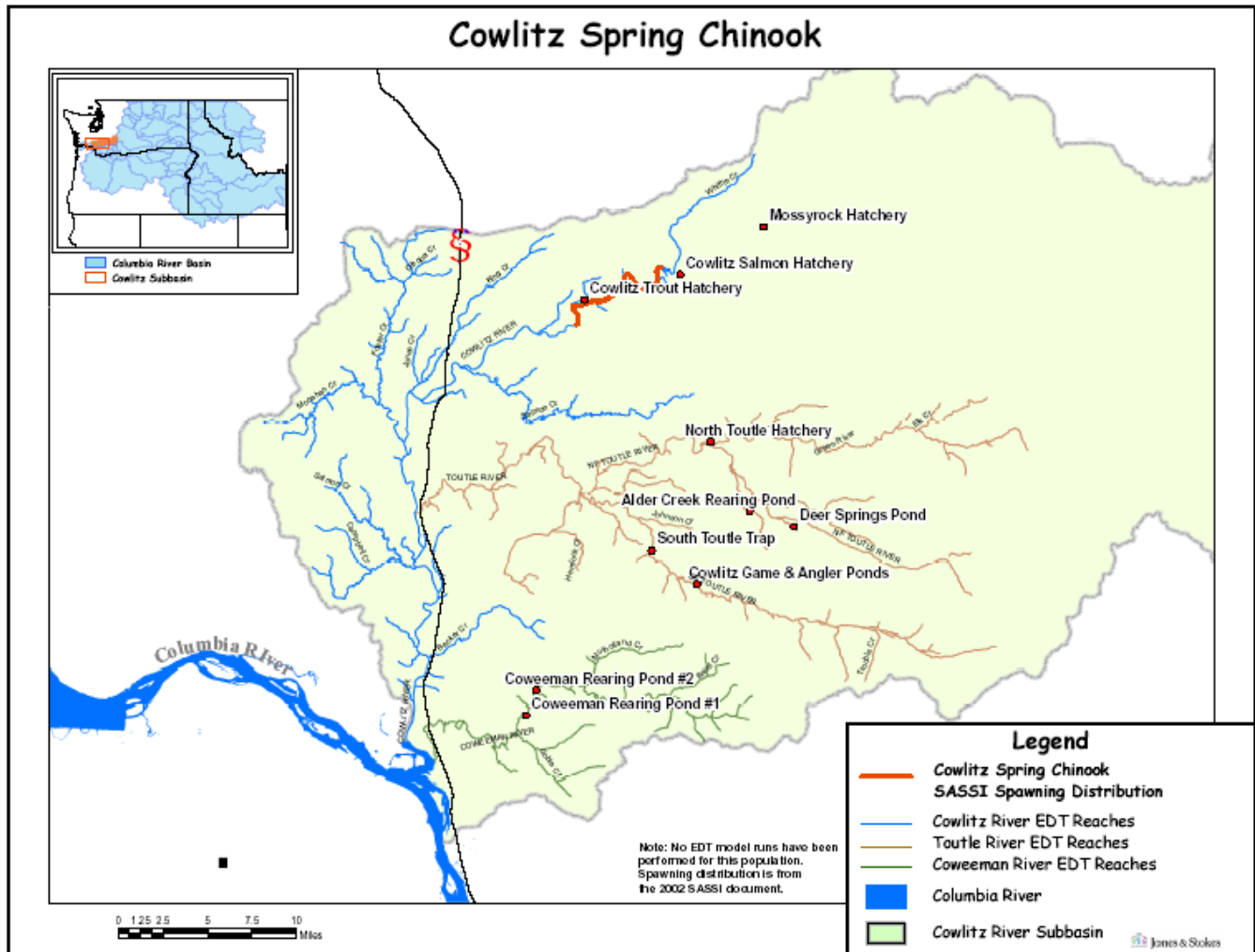


# Hatchery Scientific Review Group Review and Recommendations

## Cowlitz Spring Chinook Population and Related Hatchery Programs

January 31, 2009



# 1 Cowlitz Spring Chinook

Lower Cowlitz spring Chinook were identified as a stock based on their distinct spawning distribution and early spawning timing. Historically, all spawning occurred above the three dams on the mainstem Cowlitz in the area above Packwood and in the Cispus River between Iron and East Canyon creeks. Natural spawning now occurs primarily within an eight-mile stretch between the Cowlitz Trout Hatchery on Blue Creek and the Cowlitz Salmon Hatchery. Some adult fish are now transported to various sites above the dams as part of a restoration project. Spawning generally occurs from late August through early October.

No genetic analysis has been done on naturally-spawning Lower Cowlitz spring Chinook. Allozyme analysis of the hatchery population sampled in 1982 and 1987 showed them to be genetically similar to, but distinct from, Kalama Hatchery and Lewis River wild spring Chinook and distinct from all other Columbia River spring Chinook stocks (WDF and WDW 1993).

Hatchery spring Chinook are integrated with the Upper Historic population under NOAA's proposed listing determination (69 FR 33102 June 14, 2004). The current spring Chinook hatchery stock is listed as a core genetic legacy population in the Cowlitz system (Myers et al. 2002), and as having core/legacy status (McElhany et al. 2003). Natural escapement levels in the lower river below the barrier dam (which include hatchery-origin fish) are typically only 200 to 400 fish (SaSSI 2002), although escapement in 2003 and 2004 increased significantly (Table 3). Estimates of adults above Mayfield Dam in the 1960s indicated approximately 9,900 spring Chinook (Serl and Morrill 2004). Currently, significant numbers of adults are being transported and released into the upper watershed as part of the reintroduction efforts. Current productivity in the upper system is approximately 225,000 smolts, although less than 40,000 to 45,000 smolts (19%) can be collected at the Cowlitz Falls Fish Collection Facility.

## 2 Current Conditions

### 2.1 Current Population Status and Goals

Three populations comprise the Cowlitz spring Chinook: the Upper Cowlitz River, Cispus River and the Tilton River populations.

- **ESA Status:** These populations are listed as threatened and are part of the Lower Columbia Chinook ESU.
- **Population Description:** The stocks make up three of the nine spring Chinook stocks in the ESU. The Upper Cowlitz and Cispus River populations are designated as Primary populations and the Tilton River population is considered a Stabilizing population (LCSR&SP 2004). The hatchery stock maintained at the Cowlitz Salmon Hatchery is considered a core genetic legacy population.
- **Current Viability Rating:** Upper Cowlitz population: Low, with a goal to achieve a High+ rating. Cispus River population: Low, with a goal to achieve a High+ rating. Tilton River population: Very Low, with a goal to maintain a Very Low rating.
- **Recovery Goal for Abundance:** 7,200 naturally spawning fish.
- **Productivity Improvement Expectation:** There is no expectation cited for productivity improvement in the recovery plan.
- **Habitat Productivity and Capacity (from EDT):** Productivity 2.40; Capacity 6,530.

## 2.2 Current Hatchery Programs Affecting this Population

The program currently releases approximately 1.26 million yearlings, including 55,000 fish released from the Friends of the Cowlitz' Wallace Pond net pens located at RM 25.5 on the Cowlitz River. Approximately 930 broodstock are needed to support the in-river release program. This stock is also currently used to support a select area fishery program at the Deep River net pens, providing 200,000 eggs for this program. Up to 2,000 adults and 300,000 fingerling spring Chinook are released in the upper watershed for a reintroduction effort. There is no restriction on using hatchery-origin adults or juveniles for reintroduction until specific fish passage survival goals are met. The broodstock for the current program is of local origin and is believed to be a mixture of all historic Cowlitz River spring Chinook populations. Broodstock is collected from volitional returns to the Cowlitz Salmon Hatchery at RM 49. No natural-origin broodstock is currently collected. All natural-origin returns are currently used for the reintroduction program in the upper watershed, using adult supplementation.

The Cowlitz River Hydroelectric Project Settlement Agreement prioritizes restoring ecosystem integrity with the restoration and recovery of wild, indigenous salmonid stocks, including ESA listed and unlisted stocks. Success of reintroduction efforts may lead to a significant investment in volitional fish passage in the future.

This hatchery program:

- Uses single family pairing.
- Incorporates jacks into the broodstock at a rate of approximately 2%.
- Is conducting a juvenile time/size of release study to evaluate differences in survival and life history traits for spring Chinook released at 4, 8, and 16 fish per pound.
- The current hatchery program is described as an integrated harvest program. Since no natural-origin fish are included in the hatchery broodstock, the current proportionate natural influence (PNI) is zero. The projected estimate of pHOS (including strays from all hatchery programs) is 37%. The estimated adjusted productivity (with harvest and fitness factor effects from AHA) is 0.74. The projected average natural-origin escapement is 625 fish. The average harvest contribution from the current program is estimated to be 2,511 fish annually. Hatchery returns are projected to exceed broodstock needs by approximately 556 fish annually, with these fish used for the upper river reintroduction program.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program – from AHA summary: 369 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – from AHA summary: 65 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 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 0.7 to 1.5. Average abundance of natural-origin spawners (NOS) would increase from 559 to 1,369. Harvest contribution of the natural and hatchery populations would go from 2,561 to 849.

### 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**

There is an adult reintroduction program underway using fish that are uniquely marked. The HSRG modeled population conditions that assume reintroduction has been successful; however, it is uncertain what will sustain this population in the long term. Habitat is not limiting. Establishing a Primary population is a goal and the limitations are unknown. Currently, surplus adults and some fingerlings are placed in the upper basin (a segregated program). Downstream survival continues to be a problem (Cowlitz Falls juvenile collection efficiency). The lower basin is managed as a segregated harvest program. It will be critical to remove hatchery fish from the upper basin in order to sustain reintroduction.

Assuming reintroduction efforts are successful and selective harvest can be implemented, the Cowlitz River spring Chinook population can make a contribution to the recovery of the listed ESU even in the short term, sustaining a natural spawning population and supporting an integrated hatchery program for harvest consistent with Primary population objectives.

## Recommendations

Continue the current program in the lower river and ongoing planned reintroduction of spring Chinook in the upper river. Manage the lower river program as a segregated program.

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 Cowlitz Spring 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	1,263.6	80%	0%	38%	0.00	559	0.7	2,561	575
	Seg Harv	-	0%						-	-
No Hatchery	None	-	0%	0%	0%	1.00	1,369	1.5	849	-
HSRG Solution	None	-	50%	95%	0%	1.00	1,308	1.4	811	0
	Seg Harv	1,263.6	95%						2,214	846
HSRG Solution w/ Improved Habitat	None	-	50%	95%	0%	1.00	1,780	1.6	1,103	0
	Seg Harv	1,263.6	95%						2,214	846