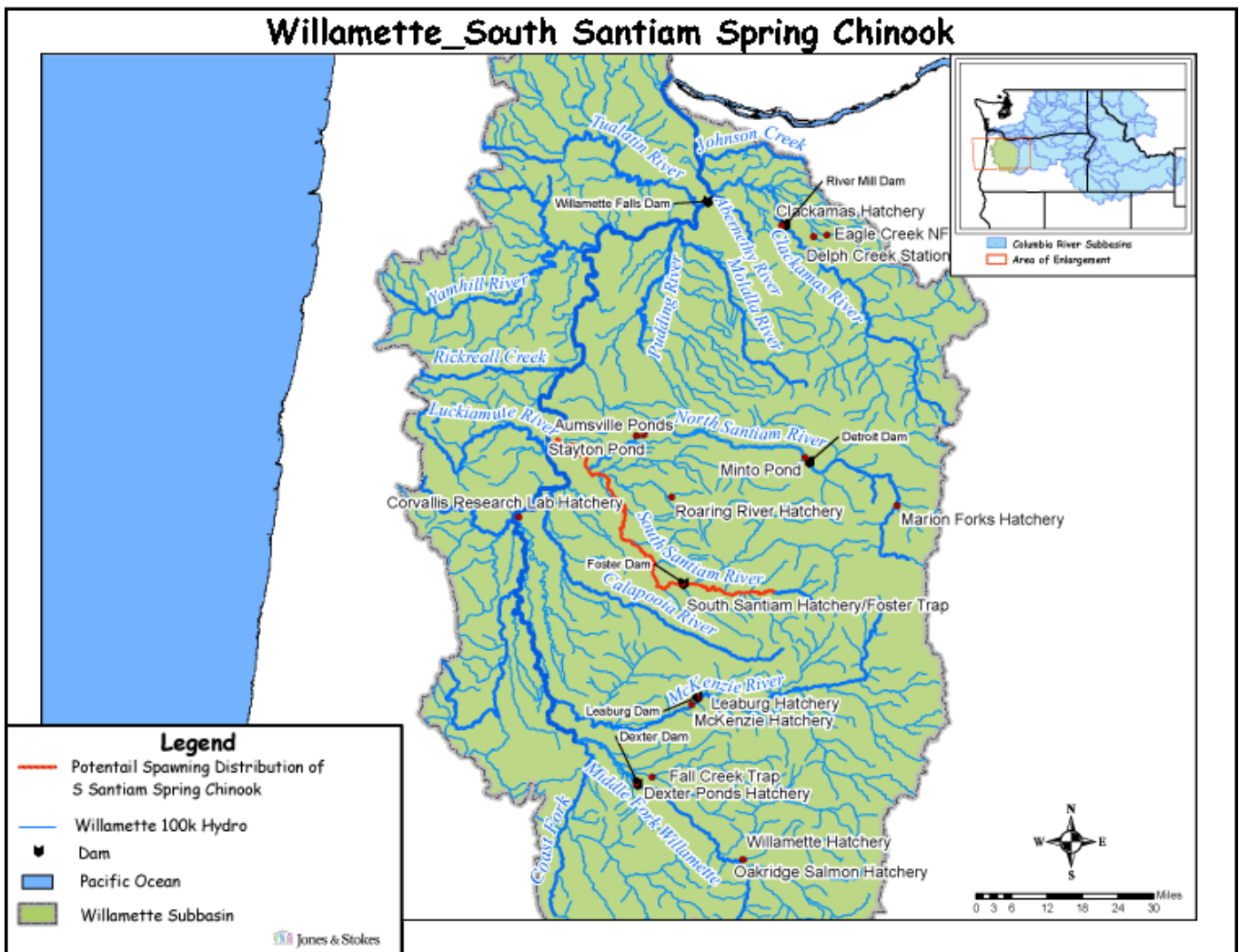


# Hatchery Scientific Review Group Review and Recommendations

## Willamette - South Santiam Spring Chinook Salmon Population and Related Hatchery Programs

January 31, 2009



# 1 South Santiam Spring Chinook Salmon

Historically, there were seven demographically independent populations of spring Chinook salmon in the Upper Willamette River spring Chinook salmon ESU: Clackamas, Molalla/Pudding, Calapooia, North Santiam, South Santiam, McKenzie, and Middle Fork Willamette—all eastside tributaries (Meyers et al. 2003). The TRT did not consider the current South Santiam Spring Chinook population as a core population, a genetic legacy, or extirpated (Subbasin Plan).

Historically, spring Chinook salmon spawned in the mainstem South Santiam and Middle Santiam rivers and in all of their major tributaries, including Thomas, Crabtree, and Quartzville creeks (Thompson et al. 1966; Fulton 1968; WNF SHRD 1995 and 1996). Construction of Foster and Green Peter dams blocked or impaired access into much of the area where Mattson (1948) observed Chinook spawning during 1947. Mattson (1948) estimated an escapement of 1,300 spring Chinook salmon to the South Santiam River in 1947. USFWS (1963) reported an annual spawning run of about 1,400 above the current site of Foster Dam. Prior to construction of the dams, about 85% of the South Santiam spring Chinook production occurred above the Foster Dam site and about 15% of the run was produced below the dam site. Thompson et al. (1966) estimated a total annual run size (natural- and hatchery-origin) of 3,700 adults during the 1960s. Estimates based on the sport catch and returns to Foster Dam indicate that the minimum total (natural-origin plus hatchery-origin) run size to the subbasin during the 1970s and 1980s varied from less than 500 to nearly 10,000 per year (Subbasin Plan).

Spawning ground survey data reported in Lindsay et al. (1999) indicated a total of 163 spring Chinook salmon redds in the South Santiam below Foster Dam during September 1998. Redd counts in the South Santiam River upstream of Lebanon Dam ranged from 10 to 144 during the period 1970 to 1993 (Willis et al. 1995). Firman et al. (2002) estimated a natural-origin run of spring Chinook salmon to the South Santiam subbasin of 965 fish in 2002, based on counts of naturally spawned carcasses and the number of unmarked fish taken for hatchery broodstock at Foster Dam. Based on otoliths, Lindsay (2003) found that 14% of the spring Chinook carcasses collected between Waterloo and Foster in 2002 were naturally spawned fish and in 2004, that figure was 9% (Schroeder et al. 2006).

Beginning in 1996, ODFW transported and released spring Chinook that returned to the Foster trap into areas above Foster Reservoir in an effort to reestablish a naturally producing run. Those numbers have ranged from 120 adults to as many as 1,850 (ODFW unpublished data). Snorkel surveys conducted annually from 1998 through 2007 indicate significant natural production in the South Santiam River above Foster Dam (ODFW unpublished data). Of 762 adult spring Chinook released above Foster Dam in 2002, most (92%) were unclipped (Hunt 2003), but since that time, outplant numbers have been a mix of marked and unmarked adults, depending on how many unmarked fish remain after broodstock selection. ODFW also has released spring Chinook trapped at Foster into Crabtree and Thomas creeks, tributaries to the South Santiam below Foster, as well as into other Willamette Basin tributaries (Abiqua Creek and the Calapooia River) (Subbasin Plan).

Recent redd surveys indicate a relatively low redd density for most of the South Santiam system, but the abundance is higher than in the North Santiam (McElhany et al. 2007 review draft). However, of the fish that return, nearly all are of hatchery-origin. In addition, estimates for pre-spawning mortality were quite high, although levels in the South Santiam appear lower than in the North Santiam.

## 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:** South Santiam spring Chinook are part of the Upper Willamette River Chinook Salmon ESU, which was listed as threatened under the ESA in March 24, 1999 (64 CFR 14308).
- **Population Description:** The South Santiam Spring Chinook population has not been assigned a designation, although it was given a Contributing designation for the HSRG review.
- **Recovery Goal for Abundance:** Unknown.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity:** Productivity 3.0; Capacity 2,500.

### 2.2 Current Hatchery Programs Affecting this Population

The South Santiam spring Chinook program is an integrated harvest program. Proposed annual release goals into the South Santiam are 20,000 unfed fry in May; 100,000 fingerlings in June (Quartzville Creek); 300,000 yearlings in November; and 453,000 1+ yearlings in February/March. This program also provides 100,000 Chinook for release into the Molalla River.

Adults are collected at the Foster Dam fish collection facility located across the river from the South Santiam Hatchery. Broodstock goals are 450 males and 450 females. The current broodstock program goal calls for 30 to 40% of the broodstock to be of natural origin. Beginning in 2002, 100% of the returning hatchery run was marked. In 2002, 45 unmarked adults were included in the broodstock, but subsequent otolith analysis showed that 42% of those fish were actually of hatchery origin. After otolith analysis of unmarked fish incorporated into the hatchery broodstock, it was determined that in 2006, 12% of the broodstock were natural-origin (South Santiam spring Chinook Draft HGMP 2007).

Currently, all fish are reared from early egg to at least fingerling size at Willamette Hatchery, which is located one mile east of Oakridge, adjacent to Salmon Creek and three miles above its confluence with the Middle Fork of the Willamette River, near RM 42. The fish are then transported back to South Santiam Hatchery for additional rearing and on-site release, or acclimation and on-site release (HGMP 2004).

Hatchery-produced spring Chinook have been present in the South Santiam River since egg collection activities began in 1923 when a weir was placed across the river near the town of Foster (Mattson 1948; Wallis 1961). Sporadic and inefficient operation of the weir probably allowed a large portion of the run to escape upstream (Wallis 1961). In other years, the hatchery may have taken all the naturally produced adults each year for broodstock. The South Santiam Hatchery began operation in 1966 to mitigate for Foster Dam, which blocked spring Chinook salmon from nearly all their historical spawning areas (Subbasin Plan).

Schroeder et al. (2002) reported that 84% of the carcasses on the South Santiam spawning grounds in 2002 were fin-clipped, compared to 73% in the North Santiam and 77% in the Middle Fork Willamette subbasin. Most freshwater coded-wire tag recoveries from South Santiam hatchery spring Chinook salmon were made within 6 miles of the hatchery of origin (W/LC TRT

2002) (Subbasin Plan). ODFW (1998) found that coded-wire tags collected from carcasses in the McKenzie River below Leaburg Dam included strays from South Santiam hatchery stocks that had been transferred to McKenzie Hatchery for rearing, but were then released in the South Santiam subbasins (Subbasin Plan).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 285 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 245 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 1.2 to 2.4. Average abundance of natural-origin spawners (NOS) would increase from approximately 540 fish to approximately 1,250 fish. Harvest contribution of the natural and hatchery populations would go from approximately 2,000 fish to approximately 335 fish.

#### 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**

The hatchery population was founded by local stock and limited introductions from other stocks have occurred. The program incorporates natural-origin adults into the broodstock. Recovery objectives have not been established. The purpose of the program is to provide fish for harvest and to act as a gene bank for South Santiam spring Chinook until access to quality habitat in the upper watershed is reestablished. Significant habitat capacity still exists above the flood control facilities, although no quantitative information on capacity and productivity was provided. Some juveniles apparently migrate successfully through Foster Reservoir, even though there are no collection facilities. About 85% of the historic production occurred above the Foster Dam site. Approximately 70% of the historic habitat (above Green Peter Dam) remains inaccessible. Without a hatchery program, there is sufficient habitat to maintain a population of approximately 1,000 spawners.

Given the assumptions used, two options were examined. A program of approximately 1,050,000 smolts releases could be operated consistent with designation as a Contributing population (pNOB=12%; pHOS=12%; 90% effective in removing out-of-basin hatchery adults). A program of up to 730,000 smolts (pNOB=15%; pHOS=7%; 90% removal of out-of-basin hatchery adults) could be operated consistent with designation as a Primary population. Alternative release sites could be developed in the Willamette Basin to compensate for reduced production and to maintain harvest benefits.

The multiple release strategy (spring releases and a fall release) contributes to maintaining life history diversity by encouraging the return of adults over a broader range of age classes.

### **Recommendations**

Depending on the population recovery designation (Primary or Contributing), we recommend that managers follow one or other of the strategies identified above.

The adult trap at Foster Dam should be upgraded to provide better adult handling and sorting capabilities to meet program goals.

The HSRG recommends that managers continue to implement their apparently successful BKD strategies, which include culling.

Table 1. Results of HSRG analysis of current conditions and HSRG solution for South Santiam 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	1,123.2	90%	0%	32%	0.24	537	1.2	1,999	1,899
No Hatchery	None None	-	0%	0%	0%	0.00	1,253	2.4	334	-
HSRG Solution	Int Harv	1,022.3	97%	0%	11%	0.52	717	1.8	2,107	2,246
HSRG Solution w/ Improved Habitat	Int Harv	1,022.3	97%	0%	8%	0.61	1,071	2.1	2,202	2,246