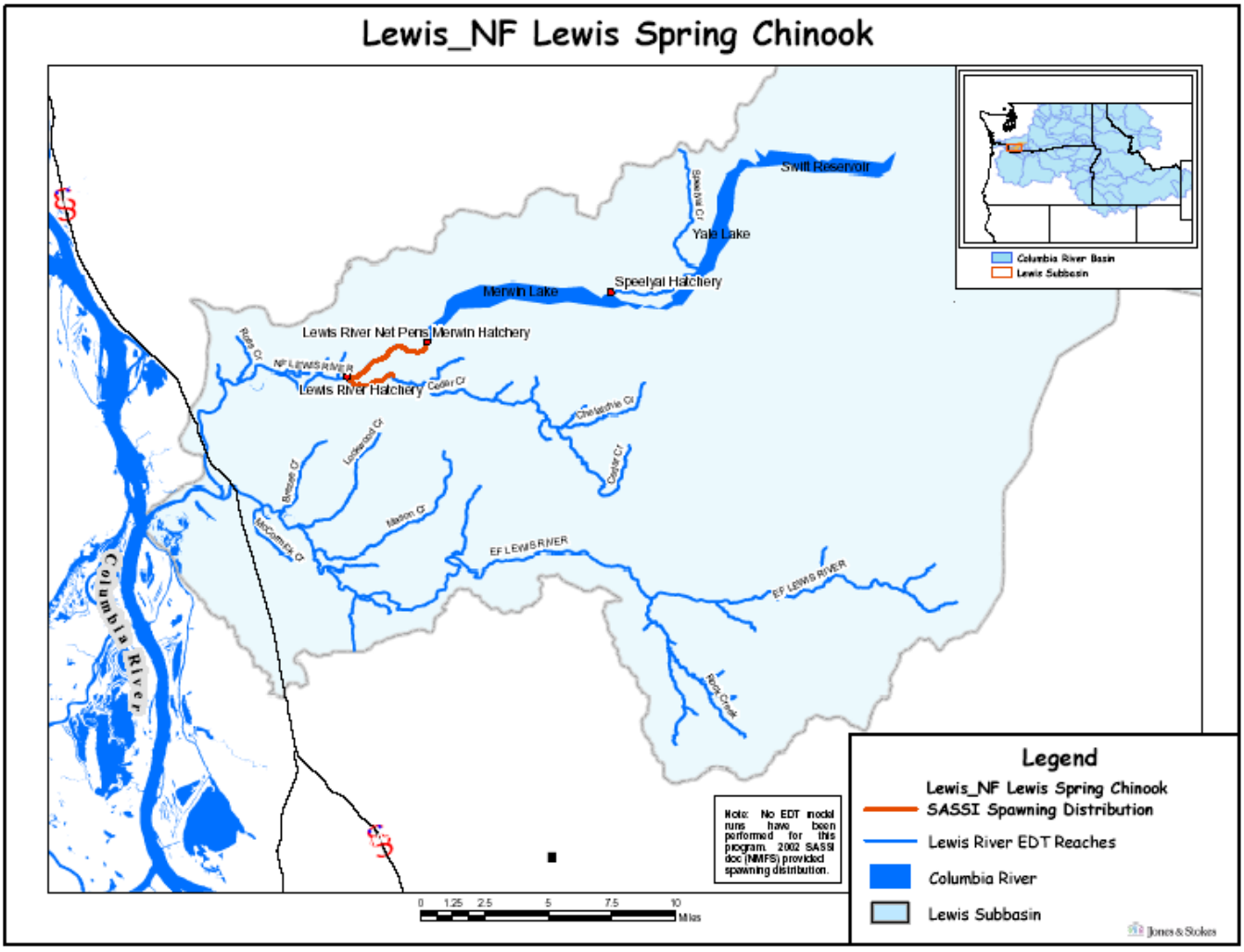
Hatchery Scientific Review Group
Review and Recommendations

Lewis River Spring Chinook
Population and Related Hatchery Programs

January 31, 2009



1 Lewis River Spring Chinook

Historically, Lewis River spring Chinook spawned throughout the upper watershed, but with the construction of Merwin Dam at RM 19.2, the majority of the spawning grounds became inaccessible. Today, natural spawning is observed in the East Fork Lewis River. Spawning generally occurs from late August through early October. Lewis spring Chinook are genetically similar to, but distinct from, Kalama Hatchery and Cowlitz Hatchery spring Chinook stocks and all other Columbia River spring Chinook stocks (WDF and WDW 1993) (SaSSI 2002).

This is a mixed stock with composite production. The native component of the stock may have been extirpated or largely replaced by introduced hatchery stocks (Myers 2002). The hatchery component has received more out-of -basin introductions than the Cowlitz or Kalama hatchery spring Chinook broodstocks. The Lewis River Hatchery broodstock was originally taken from Cowlitz and Carson National Fish Hatchery stocks in the 1970s. Since then, this stock has been propagated largely from returns to the hatchery; however, eggs and adults have been brought in from Kalama and Willamette (Oregon) hatchery stocks. The present naturally-spawning spring Chinook population in the Lewis River is composed primarily of hatchery strays (SaSSI 2002).

2 Current Conditions

2.1 Current Population Status and Goals

- ESA Status: This population is listed as threatened and is part of the Lower Columbia Chinook ESU.
- Population Description: The population is one of the nine spring Chinook populations in the ESU and is designated as a primary population (LCSR&SP 2004). The native component of the stock may have been extirpated or largely replaced by introduced hatchery stocks. The present natural spawning spring Chinook population in the Lewis River is composed primarily of hatchery strays. A program is being developed to use this stock for reintroduction into the upper watershed once passage is provided at the North Fork Lewis River hydroelectric projects.
- Current Viability Rating: Low-, with a goal to achieve a High rating.
- Recovery Goal for Abundance: 2,200 naturally spawning fish.
- Productivity Improvement Expectation: Unknown.
- Habitat Productivity and Capacity (from EDT): Productivity 4.7; Capacity 2,069.

2.2 Current Hatchery Programs Affecting this Population

The program currently releases approximately 1.33 million yearlings, including 150,000 fish released from the Fish First Echo Cove net pens (RM 10). Approximately 910 broodstock are needed to support this in-river release program. This stock is also currently used to support a select area fishery program in the Columbia River estuary using fish released from the Deep River net pens, providing 200,000 eggs for this program.

The Lewis River hatchery broodstock was originally taken from Cowlitz and Carson hatchery stocks in the 1970s. Since then, this stock has been propagated largely from returns to the hatchery; however, eggs and adults have been brought in from Kalama and Willamette (Oregon) hatchery stocks.

Hatchery operations:

- Uses single family pairing.
- Incorporates jacks into the broodstock at a rate less than 2%.

Smolt to adult survival for the hatchery program has averaged 0.38% for brood years 1988 through 1999. Contribution to fisheries has been relatively low, with total catch from the program averaging less than 1,000 fish for return years 1992 through 2001.

The current hatchery program is described as an integrated harvest program. However, since no natural-origin fish are included in the hatchery broodstock, the current proportionate natural influence (PNI) is zero. The current estimate of the proportion of hatchery-origin spawners (pHOS) in the total spawning population is approximately 36%. Accounting for the current habitat productivity, harvest and operation of the current hatchery program, the adjusted productivity for the population is estimated to be 1.45 recruits/spawner. The projected average natural-origin escapement under the current condition is 543 fish. The average harvest contribution from the current program is estimated to be 3,100 fish annually. Hatchery returns are projected to exceed broodstock needs by approximately 480 fish annually.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 367 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 1.5 to 2.9. Average abundance of natural-origin spawners (NOS) would increase from 544 to 924. Harvest contribution of the natural and hatchery populations would go from 3,156 to 573.

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 under way using fish that are uniquely marked. The goal is to establish a Primary population, although the limitations are unknown. 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. Currently surplus adults and some fingerlings are placed in the upper basin (a segregated program). Downstream juvenile collection facilities have not yet been constructed. 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 Lewis 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 segregated program in the lower river and ongoing planned reintroduction of spring Chinook in the upper river.

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 North Fork Lewis 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	None None	-	0%	0%	35%	0.00	544	1.5	337	0
	Seg Harv	1,351.4	80%						2,819	488
No Hatchery	None None	-	0%	0%	0%	1.00	924	2.9	573	-
HSRG Solution	None None	-	95%	0%	21%	0.00	457	1.5	283	0
	Seg Harv	1,188.0	90%						2,479	666
HSRG Solution w/ Improved Habitat	None None	-	95%	0%	19%	0.00	539	1.6	334	0
	Seg Harv	1,188.0	90%						2,479	559