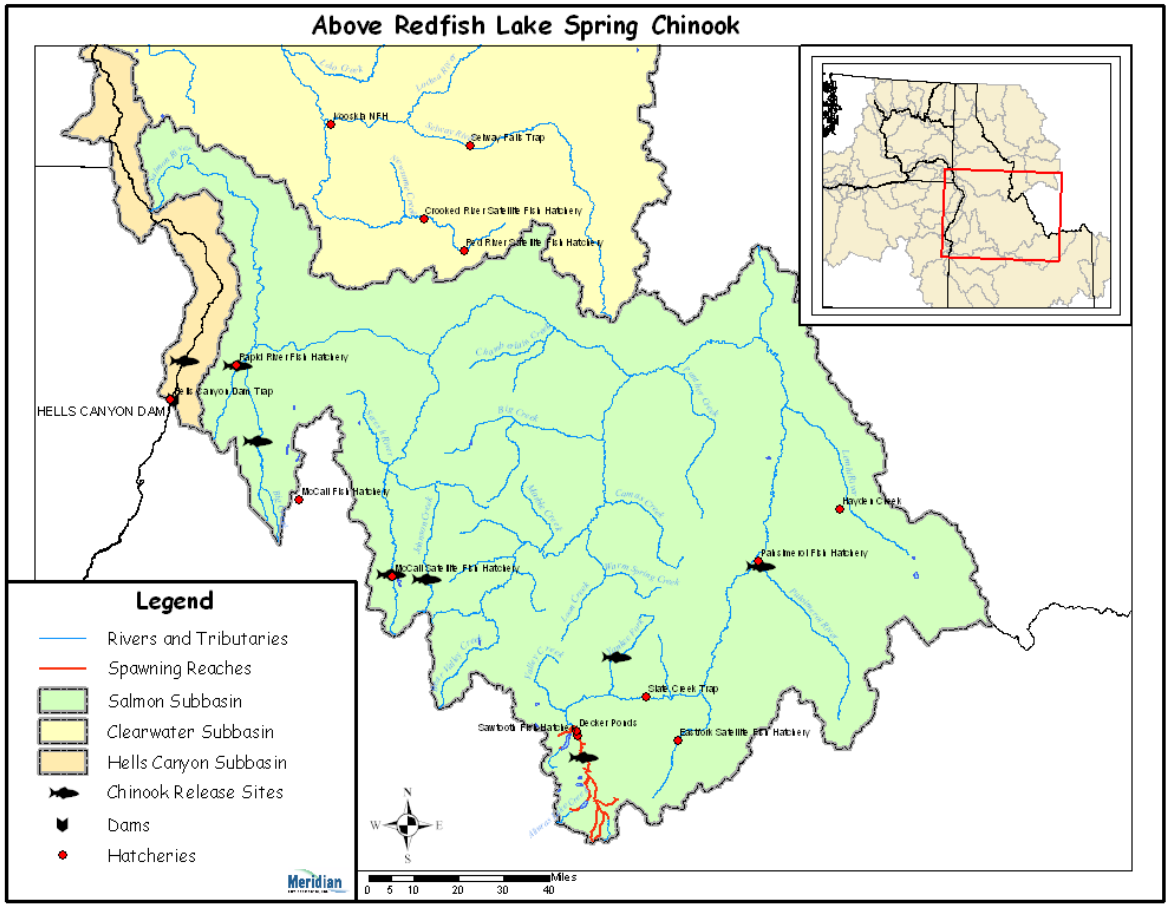
Hatchery Scientific Review Group
Review and Recommendations

Salmon River Above Redfish Spring/Summer Chinook Population and Related Hatchery Programs

January 31, 2009



1 Salmon River Spring Chinook Above Redfish Lake Creek

The Upper Salmon River Chinook population is part of the Snake River Spring/Summer Chinook ESU. This population is a spring run and is listed as threatened under the Endangered Species Act. The Interior Columbia Technical Recovery Team (ICTRT) has classified this population as "Large" based on its historic habitat potential. A "Large" population is one that requires a minimum abundance of 1,000 natural spawners and an intrinsic productivity greater than 1.56 recruits per spawner (R/S) to be viable.

Historically, it is estimated that from 2 to 3 million spring/summer Chinook returned to the entire Snake River each year (NPCC 2004). The portion returning to the Salmon River above Redfish Lake Creek is unknown, but was probably in the thousands. This designated independent population includes spawners in the mainstem Salmon River above Redfish Lake Creek and all tributaries to the main stem including Alturas Lake Creek.

2 Current Conditions

Adult spring/summer Chinook returns to the subbasin consist of both natural and hatchery-origin fish. With the exception of Rapid River stock, natural- and hatchery-origin Chinook in the Salmon River drainage are listed as Threatened. Spawning occurs in the mainstem Salmon River above Redfish Lake Creek, Alturas Lake Creek and other moderate sized tributaries. Spawning takes place from mid-July through late September. Juveniles leave the system as yearlings starting in early March and continuing into the spring.

Current (1962 to 2005) population abundance (number of adults spawning in natural production areas) has ranged from 18 fish in 1995 to 3,554 fish in 1978. Abundance in recent years has been highly variable. The most recent 10-year geomean number of natural spawners was 268 fish (NOAA Draft Recovery Plan). Redd counts for this population generally average fewer than 100 (1992-2003 StreamNet).

AHA modeling data submitted by IDFG estimates current adult escapement and adjusted productivity for the natural-origin population at 121 and 0.76, respectively. The model also estimates that 17 hatchery-origin spring and summer Chinook stray into this population each year.

2.1 Current Population Status and Goals

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

- ESA Status: Snake River Spring/Summer Chinook are listed as threatened under ESA.
- Population Description: For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for a Contributing population designation.
- Recovery Goal for Abundance: The ICTRT defined the Upper Salmon Mainstem Spring Chinook population as "Large" and identified a minimum abundance threshold of 1,000 natural-origin adults.
- Productivity Improvement Expectation: The ICTRT productivity standard associated with a population defined as "Large" is 1.56.

- Habitat Productivity and Capacity: Productivity: 1.8; Capacity: 2,000

2.2 Current Hatchery Programs Affecting this Population

The primary hatchery program affecting this population is the Sawtooth Hatchery Spring Chinook segregated harvest program.

This is a harvest mitigation program funded by BPA through the USFWS Lower Snake River Compensation Program. Initial program planning efforts identified production targets of 1.3 million smolts to be released in the Salmon River at the Sawtooth Fish Hatchery, 700,000 smolts released in the East Fork Salmon River, and 300,000 smolts released in Valley Creek, a tributary to the Salmon River. The Valley Creek component of the program has never been implemented. The East Fork Salmon River component was terminated in 1998. The current program production plan is to release approximately 1.4 to 1.7 million yearling smolts to the Salmon River immediately downstream of the hatchery. All adult trapping, spawning, incubation, and rearing occur at the Sawtooth Fish Hatchery. All fish are adipose fin-clipped and a portion coded wire and PIT-tagged for evaluation purposes. The average SAR and R/S for the hatchery program is 0.8% and 2.0, respectively.

The Salmon River spring Chinook broodstock was developed primarily from endemic sources. Prior to the construction of the Sawtooth Fish Hatchery in 1985, Chinook salmon smolts were periodically released in the vicinity of the present hatchery (first records from 1966). While locally returning adults were used as much as possible, juveniles were released from adults sourced at Rapid River Fish Hatchery, Hayden Creek Fish Hatchery (Lemhi River tributary), and Marion Forks Fish Hatchery (Willamette River drainage, Oregon) in 1967.

The Sawtooth Fish Hatchery has been part of The Idaho Supplementation Study (ISS). In 1991, IDFG, the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the USFWS initiated a large-scale Chinook salmon supplementation study designed to continue through 2012. The project incorporates treatment and control streams in the Clearwater and Salmon subbasins. The upper Salmon River is a treatment stream for this program. "Treatments" include the development and release of "supplementation" smolts (hatchery x natural parents) and the release of "supplementation" adults to treatment spawning streams (50:50 hatchery: natural-origin release design). In 2004, juvenile treatments ended in all but three study streams. In 2007, adult treatments ended. The study will conclude in 2014 following a five-year period of "no treatment."

Through the U.S. vs. Oregon court case, managers have agreed to plan and implement an integrated Chinook salmon supplementation program in the Upper Salmon River beginning in spawn year 2009.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 17 fish. Projected strays are produced primarily from the segregated program operating at the Sawtooth Fish Hatchery.

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 Recommendation 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 that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.9 to 1.6. Average abundance of natural-origin spawners (NOS) would increase from approximately 119 fish to approximately 715 fish. The harvest contribution of the natural and hatchery populations would go from approximately 369 fish to approximately 143 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation 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 incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Upper Salmon Mainstem Spring Chinook that emphasizes maintaining existing natural spawning populations as well as maintaining the current hatchery mitigation program. Currently this population is operating consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05); however, this is occurring primarily due to the low productivity of the hatchery. If hatchery productivity were to increase, it would require an ability to remove additional hatchery fish (e.g., through selective fisheries) or through the development of an integrated program to maintain the standards for a Primary population.

The LSRCP mitigation goal for this program is to return approximately 19,445 adult spring Chinook salmon to the project area upstream of Lower Granite Dam. Initial planning targets were to return 11,310 adults back to the Sawtooth Fish Hatchery, 6,090 adults back to the East Fork Salmon River, and 2,045 adults back to Valley Creek (all based on a smolt-to-adult return rate of 0.87%).

The current segregated harvest program collects broodstock from rack returns at the Sawtooth Fish Hatchery. All adult holding, spawning, incubation and rearing occur at this location. The current production target for the program is 1.4 to 1.7 million yearling smolts. Due to insufficient adult returns, this target is not consistently met. Average SAR and R/S values for hatchery-produced fish are very low (0.1% and 2.0, respectively) and currently provide relatively small harvest benefits.

The ongoing Idaho Supplementation Study is ending in 2012. Adult returns from this program ended in 2007. The current phase of the study monitors production and productivity in the absence of adult supplementation. Following 2012, managers will have greater flexibility to pursue other management options.

Chinook salmon spawning habitat for this population is located primarily upstream of the weir at the Sawtooth Fish Hatchery.

IDFG's implementation of BKD risk management strategies, including culling, has been very successful.

Recommendations

The HSRG recommends that managers implement a small (~ 200,000 smolts) integrated conservation program to support the natural population (PNI = 0.77, pHOS = 0.22, pNOB = 0.75). Broodstock for this program would initially be derived from 100% NOB, but subsequent generations would be maintained by collecting 75% NOB and 25% hatchery-origin returns from this integrated program. A separate segregated program (~ 1.2 million smolts) would be operated to address mitigation and harvest objectives. Broodstock for this program would be sourced completely from adult returns from the segregated program and would not rely on adult returns from the integrated program. However, if excess broodstock from the integrated program were available, they could be incorporated into the segregated program to maintain some genetic continuity with the naturally spawning component. Adult returns from the segregated program not needed as broodstock would need to be removed from the system or used for stream nutrification (e.g., no live fish passed upstream of the weir or returned to the population downstream of the weir.

This recommendation results in a program consistent with a "Primary" population designation. Smolts produced through the integrated program should be coded wire-

tagged but not be adipose fin-clipped. Smolts produced through the segregated program should be adipose fin-clipped.

The HSRG acknowledges that managing for the recommended PNI values may not be possible or appropriate in the near term when abundance levels are low and demographic risks to the population increase. To address this concern, managers should develop a variable sliding scale for managing abundance so that in low abundance years, more hatchery-origin fish of the appropriate population component are allowed to reach the spawning grounds to reduce demographic risk to the respective populations.

An example of such a sliding scale would look like this:

Each year, depending on NOR run size, pNOB and pHOS are allowed to "float" or slide. The HSRG assumes managers will establish an acceptable level of removal of NORs for use in the hatchery brood. This will be a fixed percentage of the total NOR return (say 40%) and will not change, regardless of NOR return. In years of high NOR abundance, this 40% could make up 100% of the needed hatchery brood (pNOB= 100%). In that case, no HORs would be used in the hatchery brood. Hatchery fish can be allowed to reach the spawning ground (pHOS) if needed to achieve an appropriate number of fish spawning naturally (demographic benefit and use of available habitat). This however, would not be required during years of very high NOR returns as both objectives (pNOB and natural spawning) may be meet with NORs.

In years of low NOR abundance, the same 40% of the NOR return would be removed for use in the hatchery brood (pNOB). However, in these years, that 40% may make up only a small part of the needed brood (i.e. pNOB 10%). In these years, enough HORs should be used to achieve needed hatchery brood and additional HORs should be allowed to spawn naturally (pHOS) to achieve the minimum acceptable level of naturally spawning.

The goal of this sliding scale is to achieve an "average" PNI over time of the desired level (0.67 or 0.5) depending on the population designation even though it may not be achieved in an one year. A good way to determine the level of NORs that should be removed each year (see above) is to review the return of NORs over a long time frame and iterate what level (30, 40, 50%) are needed, on average, to achieve the desired PNI.

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

Table 1. Results of HSRG analysis of current condition and HSRG Solution for Salmon River Spring Chinook above Redfish Lake. 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%	10%	0.00	119	0.9	24	0
	Seg Harv	1,034.9	95%						345	335
No Hatchery	None None	-	0%	0%	0%	1.00	715	1.6	143	-
HSRG Solution	Int Cons	197.4	50%	0%	23%	0.76	619	1.4	223	183
	Seg Harv	1,223.0	95%						1,883	566
HSRG Solution w/ Improved Habitat	Int Cons	197.4	50%	0%	18%	0.80	821	1.6	263	183
	Seg Harv	1,223.0	95%						1,883	566