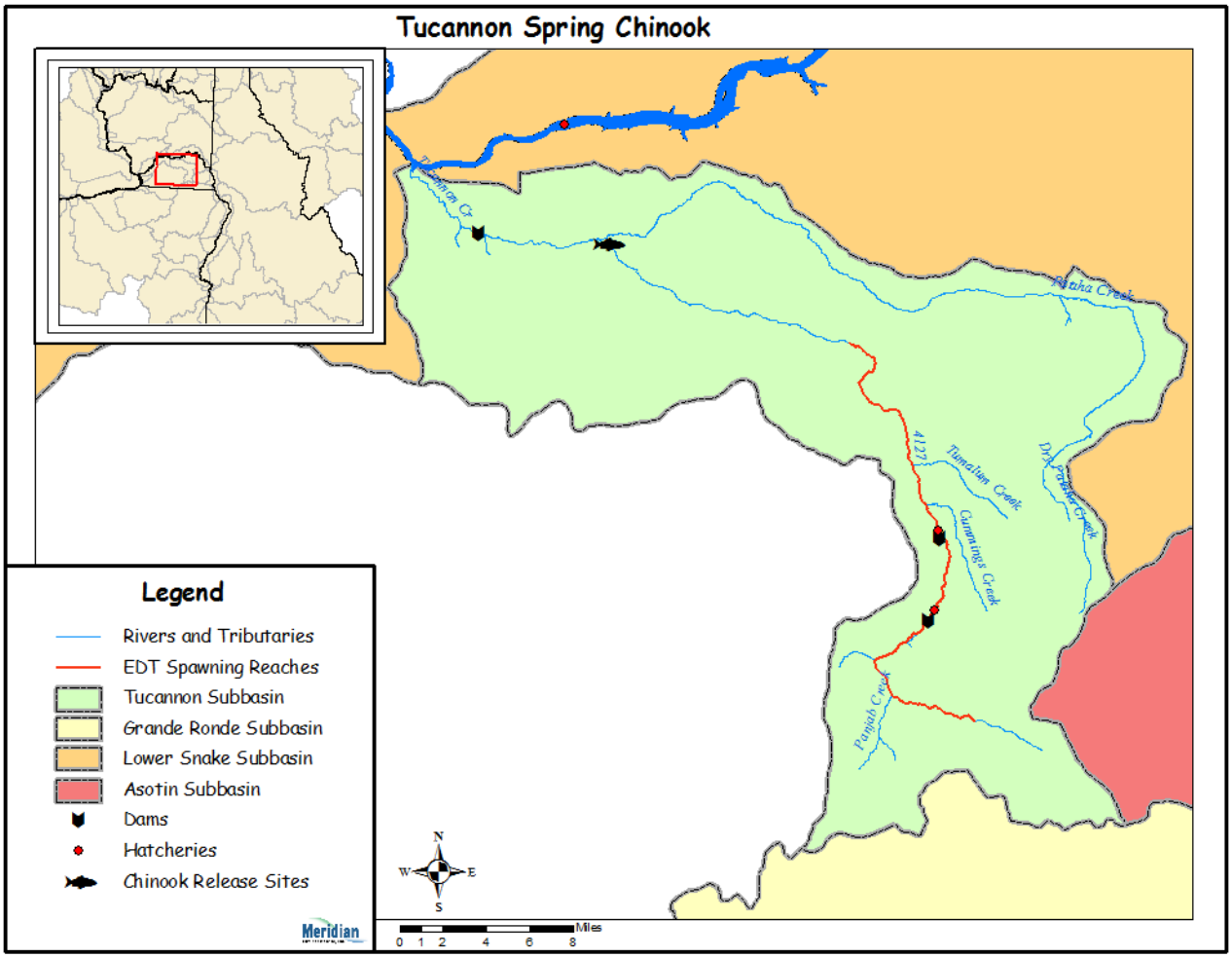
Hatchery Scientific Review Group
Review and Recommendations

Tucannon River Spring Chinook Population
and Related Hatchery Programs

January 31, 2009



1 Tucannon River Spring Chinook

The Tucannon River Spring/Summer Chinook population is part of the Snake River Spring/Summer Chinook ESU that is classified as threatened under the Endangered Species Act. This ESU has five major population groupings (MPGs), including: Lower Snake River, Grande Ronde/Imnaha, South Fork Salmon River, Middle Fork Salmon River, and the Upper Salmon River group. The ESU contains both spring and summer run Chinook.

The Tucannon population is a spring/summer run, and is one of two historic populations in the Lower Snake River MPG. The other historic population in the Lower Snake MPG is Asotin Creek; recently it was classified by the Interior Columbia Technical Recovery Team (ICTRT) as functionally extirpated.

The ICTRT has classified this population of Chinook as an "Intermediate" population in size based on its historic habitat potential. An "Intermediate" population is one that requires a minimum abundance of 750 wild spawners and an intrinsic productivity of 1.8 recruits per spawner (R/S) to be viable at the 5% extinction risk threshold.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPPC 2004). The portion returning to the Tucannon River is unknown, but was likely in the thousands. Spawning likely took place primarily in the mainstem Tucannon River.

2 Current Conditions

Tucannon River spring/summer Chinook typically spawn and rear above RKM 40. Population diversity and abundance has been reduced due to in-basin habitat degradation, harvest, and juvenile and adult mortality associated with passage through federal Columbia River hydropower system.

According to the ICTRT, recent abundance (1979-2003) of 3+ spring Chinook for this subbasin has ranged from 11 to 897 fish[1]. Natural spawners include returns from the Lyons Ferry Hatchery supplementation program (which began in 1988), a program that historically used both natural- and hatchery-origin broodstock in a 1:1 ratio. Natural-origin spawners have averaged about 70% of the total adult escapement. Out-of-ESU strays spawning naturally in the basin generally have been less than 5%, with Umatilla River-origin fish making up a large proportion of this value.

The Tucannon Hatchery released approximately 240,000 spring Chinook yearlings to the Tucannon River in 2007 (both captive brood and conventional hatchery production). The captive brood program is being terminated.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for Tucannon Spring Chinook.

- ESA Status: Tucannon River Spring Chinook are part of the Snake River Spring/Summer Chinook ESU.

[1] WDFW staff indicates that abundance values may be too low; however, they were based on NMFS ICTRT analysis.

- Population Description: The Tucannon River population is classified by the ICTRT as an "Intermediate" population. For the HSRG review, the population has been classified as Primary.
- Recovery Goal for Abundance: 750 wild spawners
- Productivity Improvement Expectation: 10%
- Habitat Productivity and Capacity: Productivity 2.2; Capacity 550

2.2 Current Hatchery Programs Affecting this Population

There are two hatchery programs operating within the subbasin that affect the Tucannon spring Chinook population.

1. Tucannon Supplementation Program: This program has a release goal of 130,000 spring Chinook smolts to the Tucannon River. Future plans are to expand total releases to 225,000 smolts. Fish are released at the Tucannon Hatchery in March/April at approximately 15 fpp; however, recent releases have been in 7-8 fpp range. Juveniles are 100% adipose fin-clipped. Broodstock (170) are collected at the Tucannon Fish Hatchery Trap located at RKM 59 on the mainstem Tucannon River. The trap is assumed to have about a 90-95% adult trapping efficiency. Broodstock are transferred to Lyons Ferry Hatchery where they are spawned, the eggs incubated and juveniles reared. Broodstock consists of approximately 50% NOR and 50% HOR adults, depending upon the run. The program has an R/S value of 3.0.

2. A captive brood hatchery program using endemic Tucannon spring Chinook has been operating for several years with the goal of releasing 150,000 smolts per year. This program is being terminated and final returning adults should enter the Tucannon River in 2011.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated programs: 200
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs : 1

According to WDFW staff, Umatilla Hatchery strays have exceeded 8% in several years. Also, PIT tag data indicates that up to 36% of the Tucannon spring Chinook returning adults migrate upstream of Lower Granite Dam. Only with the use of PIT tags in recent years have these fish been accounted for.

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 (proportionate natural influence) 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 Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.3 to 2.1. Average abundance of natural origin spawners (NOS) would increase from approximately 184 fish to approximately 291 fish. Harvest contribution of the natural and hatchery populations would go from approximately 88 fish to approximately 41 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

Lyons Ferry Hatchery (LFH) and Tucannon Fish Hatchery (TFH) were built/modified under the Lower Snake River Fish and Wildlife Compensation Plan. One objective was to compensate for the estimated annual loss of 1,152-spring Chinook (Tucannon River stock) caused by hydroelectric projects on the Snake River. The standard supplementation production goal is 132,000 fish for release as yearlings at 15 fpp. (Tucannon River Spring Chinook Salmon Hatchery Evaluation Program: 2005 Annual Report, August 2006)

Managers have not assigned a population designation for Tucannon spring Chinook. The HSRG assumed this population should be considered a Primary population. As currently managed, it is not consistent with that designation, having a PNI less than 0.67. Currently this population is meeting the standard for a Contributing population (PNI of 0.54). Beginning with the 2006 brood year the hatchery program release goal will be 225,000 smolts; however, the program currently releases 130,000 smolts. A captive broodstock program has operated in the Tucannon since the

1990s with a release goal of 150,000 smolts. Managers recently terminated this program and final adult returns are expected in 2011. With current habitat capacity and productivity levels, the identified conservation goals for this population are not be achievable. The HSRG questions the contribution the Tucannon can make to recovery of the ESU without substantial habitat improvements in the watershed.

The hatchery program is providing a conservation demographic benefit to the population by reducing extinction risks, but it also poses increased genetic risks to the natural population.

Based on PIT tag information, managers indicated that a substantial portion of adults are bypassing the Tucannon River and have been detected at Lower Granite Dam. Managers also indicated that the spawning distribution of both wild and hatchery fish has shifted downstream. Both of these issues negatively affect the productivity of the population.

Recommendations

The HSRG developed a solution that allows this population to meet the standards of a Primary or a Contributing population. The HSRG recommends that spring Chinook observed at the Lyons Ferry Hatchery outfall be collected and their origin determined. Those identified as Tucannon-origin fish should be incorporated into the existing program. Fish of unknown origin should be returned to the river. In addition, the HSRG recommends developing long-term rearing capabilities within the Tucannon River subbasin.

The HSRG looked at various hatchery scenarios that could improve productivity, but could not significantly increase natural-origin spawning under current habitat conditions. Changes to the current program described below could be implemented to provide additional harvest opportunities and maintain the abundance of natural-origin spawners.

If managed as a Primary population, a program of approximately 100,000 smolts with a 50% pNOB and a pHOS of 25% would be consistent with this designation. For this to be achieved, a minimum of 50% of the hatchery fish returning to the Tucannon River would need to be removed at the weir or by selective terminal harvest.

If managed as a Contributing population, a larger program of approximately 160,000 smolts with a 50% pNOB and a pHOS of 48% would be consistent with this designation. For this to be achieved, a minimum of 50% of the hatchery fish returning to the Tucannon River would need to be removed at the weir or by selective terminal harvest.

Unless habitat improvements occur, it does not appear that planned program size of 225,000 smolts can be achieved and be consistent with the standards of a Primary or Contributing population.

Managers should consider demographic risks to the population and modify their protocols during periods of low abundance. Managers also should develop a variable sliding scale for abundance so that in low abundance years, more of the appropriate stock is allowed to reach the spawning grounds.

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 any 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 managers should investigate ways to address straying of Tucannon Spring Chinook above Lower Granite Dam and the distribution of spawners within the Tucannon watershed.

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 Tucannon 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 Cons	132.6	20%	0%	47%	0.52	184	1.3	88	12
No Hatchery	None None	-	0%	0%	0%	1.00	291	2.1	41	-
HSRG Solution	Int Cons	163.4	50%	0%	44%	0.53	167	1.4	104	108
HSRG Solution w/ Improved Habitat	Int Cons	163.4	50%	0%	37%	0.58	226	1.7	112	108