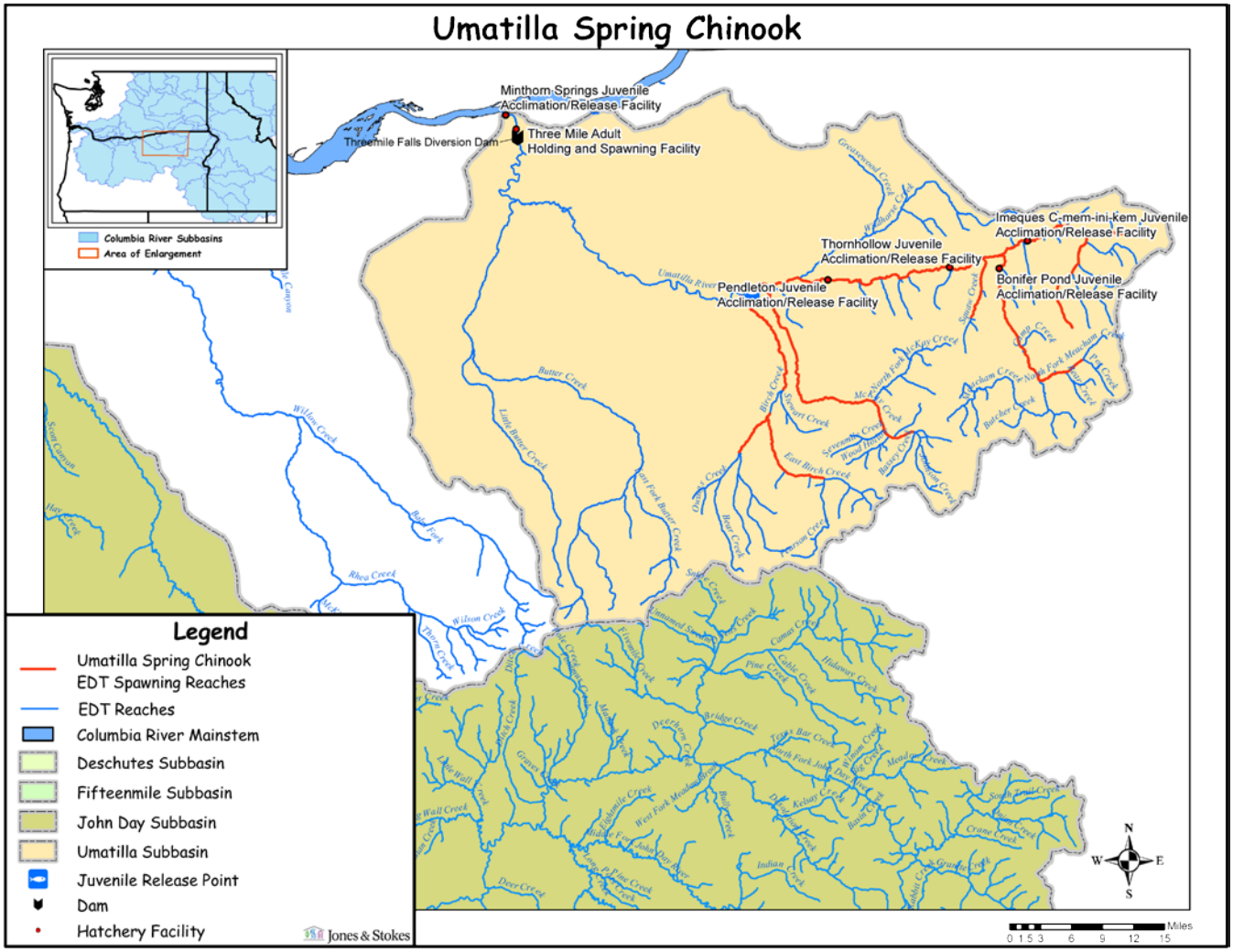
Hatchery Scientific Review Group
Review and Recommendations

Umatilla Spring Chinook
Population and Related Hatchery Programs

January 31, 2009



1 Umatilla Spring Chinook

The Umatilla/Willow subbasin is a 3,714-square-mile area in northeastern Oregon, situated primarily in Umatilla and Morrow Counties, with a small portion extending into Union County. The Umatilla/Willow subbasin is composed of four drainages: the Umatilla subbasin, the Willow Creek subbasin, the Six-Mile Canyon drainage, and the Juniper Canyon drainage. The mainstem Umatilla River is 89 miles long and the river and its tributaries drain an area of nearly 2,290 square miles. Willow Creek is 79 miles long and drains an area of about 880 square miles. The Six-Mile Canyon area, which contains intermittent streams that rarely drain into the Columbia River, is 472 square miles. The mainstem of Juniper Canyon Creek is 19 miles long and drains 72 square miles (Umatilla Subbasin Plan 2004).

Habitat degradation due to agricultural water withdrawal, construction of Three Mile Dam, and forest management practices led to the extirpation of salmon from the Umatilla subbasin in the early 1900s (Umatilla Subbasin Plan 2004).

Carson stock spring Chinook from the Little White Salmon Hatchery were used to begin reintroduction efforts in 1986. Attempts have been made to count adult returns since 1988. Average adult returns between 1988 and 2002 were 1,968 with an apparent upward trend in returns. Only 23 to 348 naturally-produced adults returned to the basin between 1988 and 2004, with hatchery-origin returns forming the bulk of the adult returns. The productivity of the spring Chinook population appeared to be increasing over the years 1991 to 2002, based on the number of redds and the number of spawned-out female carcasses. However, from 1992 to 1997, the population was below replacement every year except one (1992), based on the number of adults returning per spawner. Current spawning distribution is much smaller than the estimated historic distribution. The current distribution is limited to the upper mainstem, the North Fork Umatilla, and Meacham Creek. The historic distribution included the middle mainstem and McKay, Birch, and Butter Creeks.

Beginning in 1998, the majority of the broodstock has come from adults returning to the Umatilla River. As a result of the hatchery program, returns of spring Chinook have been large enough to support a sport and tribal harvest in 10 of the last 13 years (Umatilla Subbasin Plan 2004).

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: Naturally spawning spring Chinook in the Umatilla system are the result of hatchery plants and are not included in any ESU nor listed under the ESA.
- Population Designation: Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette results in a designation of Contributing.
- Current Viability Rating: Unknown.
- Abundance Goals from Umatilla Hatchery Master Plan (1989): 1,000 wild adults.
- Productivity Improvement Expectation: Unknown.
- Habitat Productivity and Capacity (from EDT): Productivity: 2.42; Capacity: 942.

2.2 Current Hatchery Programs Affecting this Population

An integrated hatchery program operates in the Umatilla, rearing Carson stock spring Chinook. This program originally operated with the intent of reintroducing spring Chinook to the subbasin. Now that adult returns to the Umatilla are supporting the hatchery program, it is operating with the objective of supporting harvest opportunities.

From brood years 1984 to 1999, Carson stock adults were collected from various sources (Cascade National Fish Hatchery [NFH], Lookingglass Hatchery, Big Canyon Hatchery, Ringold Hatchery, Little White Salmon NFH, and from adult returns to the Umatilla River). Since 2000, all spring Chinook salmon broodstock have been collected from the Umatilla River.

The goal of this program is to collect 588 adults (5% jack component) at Three Mile Falls Dam to hold at the South Fork Walla Walla holding facility until ripe. Spawning at the facility typically occurs from mid-August through September. Spawning occurs weekly and mating is 1:1. Fertilized eggs are transferred to the Umatilla Hatchery for incubation. At the eyed stage, approximately 400,000 eyed eggs are transferred to the Little White Salmon NFH where they complete their rearing. The remaining eggs (approximately 1,000,000) complete their incubation and rearing at the Umatilla Hatchery.

From the Umatilla Hatchery, 600,000 yearlings are transported to the Imeques Acclimation Site at Umatilla RM 80 in late February or early March, where they are acclimated for 3 weeks and volitionally released in mid-March at approximately 15 fpp. In addition, 210,000 yearlings from the Little White Salmon NFH are transported to the Imeques Acclimation Site in late March or early April, where they too are acclimated for 3 weeks and volitionally released in mid-April at approximately 15 fpp.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 3,387 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 60 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 1.1 to 1.9. Average abundance of natural-origin spawners (NOS) would decrease from approximately 480 fish to approximately 367 fish. Harvest contribution of the natural and hatchery populations would go from approximately 2,408 fish to approximately 110 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

Managers have identified two goals for this population: one is to establish a natural sustainable population and the other is to provide harvest opportunities.

On one hand, current habitat quality and quantity is limited in this basin, as evidenced by the extirpation of the population. This condition limits opportunities for successful establishment of a natural self-sustaining population. On the other hand, because of passage improvements and collection facilities at Three Mile Dam, it is possible to monitor and manage broodstock spawning composition that may increase the likelihood of developing a small locally adapted naturally spawning population that would benefit from on-going and proposed habitat improvements.

As currently operated, this program is making no progress toward establishing a sustainable natural population. The continual high proportion of hatchery spawners from the current hatchery program (with a PNI less than 0.1) allows no opportunity for the population to adapt to the local environment. A PNI greater than 0.5 is necessary for the natural environment to drive adaptation and increase fitness.

Without significant habitat improvements, the natural-origin population will remain relatively small. It is unlikely that this stock could meet the abundance guidelines for a Primary population.

Recommendations

To meet the management goal of developing a sustainable natural population while maintaining harvest benefits, we recommend that hatchery broodstock be managed in the following ways. Develop a two-stage stepping stone program to support the natural population and to provide harvest. The program would consist of an integrated conservation component producing approximately 250,000 smolts. This component would initially be produced from 100% natural-origin broodstock, but subsequent generations would be maintained by collecting 60% natural-origin broodstock and 40% hatchery-origin returns from this component. Excess hatchery-origin returns from the conservation component would provide all broodstock to maintain an additional second stage harvest component of approximately 560,000 smolts. Unharvested hatchery returns from the harvest component would not be used for broodstock. This would require differential marking of juveniles from the two programs. For example, the juveniles from the conservation program would be coded-wire tagged only, while the harvest program fish would be adipose-marked and partially coded-wire tagged.

In order to assure optimal distribution of naturally spawning fish, juveniles from the conservation program should be acclimated and released in the upper watershed nearer primary spawning habitat. This may require development of a new site further up in the watershed. Managers should also consider trucking adults returning to Three Mile Dam from the conservation program and natural-origin adults to the spawning grounds.

Juveniles from the harvest program should be acclimated and released as currently occurs.

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 Umatilla 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 Both	925.2	20%	0%	85%	0.07	480	1.1	2,408	253
	Stepping Stone Hatchery Seg Harv	-	20%						-	-
No Hatchery	None None	-	0%	0%	0%	1.00	367	1.9	110	-
HSRG Solution	Int Cons	277.6	60%	0%	57%	0.51	335	1.5	812	249
	Stepping Stone Hatchery Seg Harv	562.2	20%						1,369	515
HSRG Solution w/ Improved Habitat	Int Both	277.6	60%	0%	52%	0.53	401	1.7	832	249
	Stepping Stone Hatchery Seg Harv	562.2	20%						1,369	515