

1 Clackamas Spring Chinook Salmon

This population is part of the Upper Willamette River Chinook ESU. Historically, there were seven demographically independent populations of spring Chinook salmon in this ESU: Clackamas, Molalla/Pudding, Calapooia, North Santiam, South Santiam, McKenzie, and Middle Fork Willamette—all eastside tributaries (Meyers et al. 2003). Today, the Clackamas River population is one of four core populations (Clackamas, North Santiam, McKenzie and Middle Fork Willamette). The Clackamas River subbasin historically sustained a large spring Chinook population and may have the intrinsic capacity to sustain a large population into the future (McElhany et al. 2003) (Subbasin Plan).

According to ODFW (2001), historical spawning by indigenous spring Chinook occurred in the upper Clackamas subbasin in the mainstem and in tributaries, including Eagle Creek, Fish Creek, Roaring River, and the Collawash River. Access to spawning areas was severely impeded or prevented by the Faraday and River Mill dams from 1906 to 1939. The historic spring Chinook population declined, due to commercial fishing, lack of access to spawning grounds, and egg-taking operations. Construction of the Cazadero Dam in 1904 (RM 26.7) and River Mill Dam in 1911 (RM 23) limited migratory access to the majority of the historical spawning habitat for the spring run. In 1917, the fish ladder at Cazadero Dam was destroyed by floodwaters, eliminating fish passage to the upper basin (ODFW 1992); the ladder was not repaired until 1939 (PGE 2007). During this period, natural production of spring Chinook was restricted to the lower 23 miles of the Clackamas River and Eagle Creek (Subbasin Plan).

The recolonization of the upper Clackamas River progressed very slowly, with the average annual spring Chinook dam count (River Mill or North Fork Dam) from 1952 to 1959 being 461 (Murtagh et al. 1992). More importantly, 30% of the adult passage counts occurred in September and October. The source of the spring Chinook that recolonized the upper Clackamas Basin is not known. It most likely included some Clackamas fish that persisted below Faraday Dam, plus strays from the upper Willamette River tributaries, due to passage problems at Willamette Falls (located just above the mouth of the Clackamas) and pollution in the lower Willamette (Subbasin Plan).

Currently, natural production habitat is thought to be relatively productive in at least the Clackamas mainstem and tributaries above North Fork Dam. Spawning ground surveys for spring Chinook salmon were conducted in the Clackamas River basin from 1996 through 2007 to document timing, distribution, and abundance of natural spawning. The mainstem of the upper Clackamas River above North Fork Dam is the most important spawning area for spring Chinook salmon, accounting for an average of 85% of the redds. Only 15% are accounted for in tributaries. The mean annual redd count in the upper mainstem was 236 during the period. Redds in the upper mainstem from Sisi Creek to the head of the North Fork Reservoir are fairly uniformly distributed, with the section from the mouth of the Collawash River to Cripple Creek usually containing the highest redd densities. Of the tributaries, the Collawash River is the most heavily used by spring Chinook in the basin. Spring Chinook salmon also spawn in the lower Clackamas River below River Mill Dam, but not as heavily as above North Fork Dam. The lower Clackamas River accounted for 11% of the total redds in the Clackamas Basin in 1998 (predominantly hatchery-origin fish concentrated near McIver Park [personal communication, Todd Alsbury, ODFW, January 2008]), when both of the lower sections were surveyed. Although fall Chinook salmon also use the lower Clackamas River, spring Chinook predominate in the area just below River Mill Dam (Subbasin Plan).

The population long-term geometric mean is about 900 natural-origin spawners (McElhany et al. 2007 review draft). In recent years (1990-2005), the geometric mean of natural-origin spawners was 1,656, with a pHOS of 0.47. It has been estimated that about 20% of the spring Chinook females die before spawning.

In 1976, the ODFW Clackamas River Hatchery (located below River Mill Dam) began releasing spring-run Chinook salmon. Increases in adult returns over the North Fork Dam and increases in redd counts above the North Fork Reservoir corresponded to the initial return of adults to the hatchery in 1980 (ODFW 1992; Willis et al. 1995). Adult counts over North Fork Dam rose from 592 in 1979 to 2,122 in 1980 (Murtagh et al. 1992). Recent changes in management policy by ODFW include acclimating and releasing hatchery fish farther downstream and mass-marking all hatchery releases to allow the removal of hatchery fish ascending the North Fork Dam.

Genetic analysis by NOAA Fisheries of naturally produced fish from the upper Clackamas River indicated that this stock was similar to hatchery stocks from the upper Willamette Basin (Myers et al. 1998). This finding agrees with an earlier comparison of naturally produced fish from the Collawash River (a tributary to the upper Clackamas River) and upper Willamette River Hatchery stocks (Schreck et al. 1986). Fish introduced from the upper Willamette River have significantly introgressed into, if not overwhelmed, spring-run fish native to the Clackamas River Basin and obscured any genetic differences that existed prior to hatchery transfers.

The Upper Willamette spring Chinook ESU populations exhibit early run timing relative to other Lower Columbia River populations. Historical records indicate that spring Chinook entered the Clackamas River in March or April, sometimes even in February, prior to the Upper Willamette fish runs.

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:** Clackamas 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 Clackamas spring Chinook population has not been assigned a recovery designation. This is considered a core population by TRT and was given a Primary designation for the HSRG review.
- **Recovery Goal for Abundance:** Unknown.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity (e.g., from EDT):** Productivity: 3.62, Capacity: 3,003.

2.2 Current Hatchery Programs Affecting this Population

The Clackamas River Hatchery spring Chinook segregated harvest program augments sport and commercial salmon fisheries in the Clackamas, Willamette, and Columbia rivers. It provides mitigation pursuant to agreements with the Federal Energy Regulatory Commission and NOAA Fisheries for loss of habitat quantity and quality resulting from construction and operation of PGE and Corps of Engineers hydropower projects on the Clackamas and Columbia rivers, respectively.

The Clackamas River spring Chinook stock was developed from other Willamette Basin hatchery spring Chinook stock smolts released at Dog Creek (site of Clackamas Hatchery) beginning in 1976 (ODFW 1992). The Clackamas Hatchery began operation in 1979 and the first releases of spring Chinook occurred here in November 1979 (1978 brood), while the last release of smolts from adults not collected here occurred in 1989 (1987 brood). Since 1988, the Clackamas Hatchery spring Chinook broodstock has been composed entirely of returns to the Clackamas Hatchery.

Annually, approximately 300,000 pre-smolts are released from the Clackamas River Hatchery (at approximately RM 22.6) and 900,000 smolts are released into the Clackamas River at five other locations, including Cassidy Pond (RM 17; 50,000 smolts), Clackamette Cove (RM 0.5; 80,000 smolts), Foster Creek (50,000 smolts), Clear Creek (50,000 smolts), Eagle Creek (200,000 smolts) and at the hatchery (470,000 smolts) (HGMP 2004). Smolt-to-adult survival rates for brood years 1989 through 1995 ranged from 0.11 to 0.36 (HGMP 2004).

Current practices are designed to minimize the presence of hatchery-origin fish on natural spawning grounds. Returning hatchery-origin adults (identified by fin-clip or the presence of a coded-wire tag) have not been intentionally passed above North Fork Dam since 1998. Only unmarked fish are allowed to migrate above this point into the primary Clackamas Basin spring Chinook spawning grounds. There is a potential that some unmarked hatchery fish could be unintentionally passed upstream due to errors in the fin-clipping process, or as unmarked coded-wire tagged fish (double index tags through 2009). The frequency of these occurrences is currently not well known (HGMP 2004).

No quantified data exist for the percent of hatchery fish spawning naturally below North Fork Dam, though ODFW has observed that it does occur and the percentage of hatchery-origin fish is relatively high. ODFW does not believe that significant natural spring chinook production originates from this lower portion of the basin (HGMP 2004).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 47 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 2.4 to 2.8. Average abundance of natural-origin spawners (NOS) would increase from approximately 1,430 fish to approximately 1,700 fish. Harvest contribution of the natural and hatchery populations would go from approximately 1,600 fish to approximately 450 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

In the absence of specific harvest and conservation goals, we note that this program is operated consistent with the standards for a Primary population. An integrated program of similar size (approximately 1.0 million smolts) also could be operated consistent with these standards and could provide additional conservation safety benefits. Passage into the upper basin is regulated at North Fork Dam, which provides flexibility for this program.

Because of the existing available water sources in the Clackamas, fish are moved between facilities in the Willamette. This raises risks of pathogen transfer and straying; however, no specific problems were noted and no reasonable alternatives have been identified to alleviate this situation.

Recommendations

The HSRG offers no specific recommendations for modifying this population.

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 Clackamas 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	-	50%	95%	2%	0.00	1,431	2.4	382	0
	Seg Harv	1,077.8	50%						1,229	
No Hatchery	None	-	0%	95%	0%	1.00	1,690	2.8	451	-
	None	-	50%	95%	2%	0.00	1,433	2.4	382	0
HSRG Solution	None	-	50%	95%	2%	0.00	1,433	2.4	382	0
	Seg Harv	1,077.8	50%						1,229	
HSRG Solution w/ Improved Habitat	None	-	50%	95%	2%	0.00	1,740	2.7	464	0
	Seg Harv	1,077.8	50%						1,229	