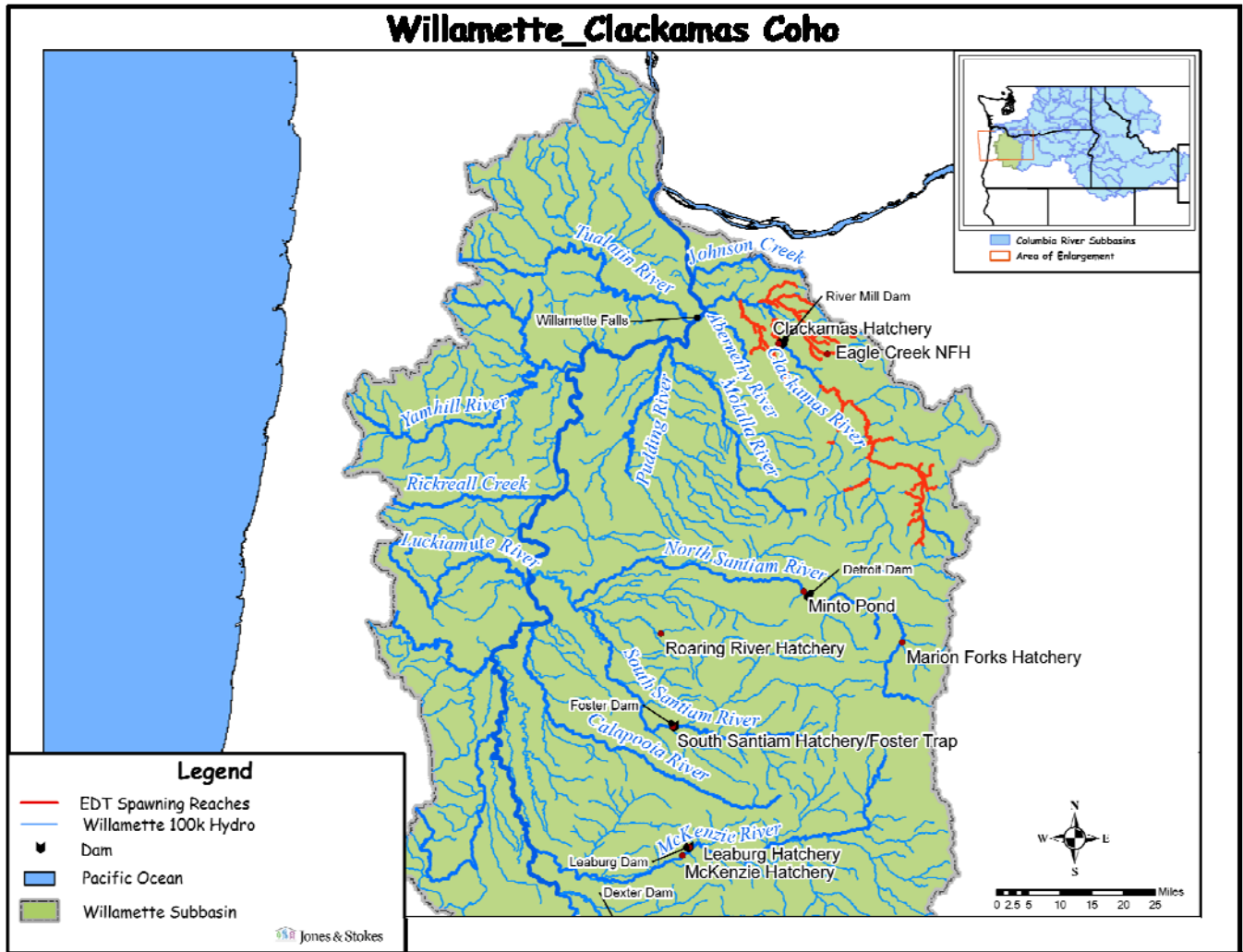


Hatchery Scientific Review Group Review and Recommendations

Willamette - Clackamas River Coho Salmon Population and Related Hatchery Programs

January 31, 2009



1 Clackamas Coho Salmon

Coho salmon in the Clackamas River consist of two population components, a lower river and an up river component. The up-river component is believed to be descended from the native Clackamas River population and is managed for wild production. The lower river component is heavily influenced by hatchery fish released into the lower river. This report describes both population components.

Early coho enter the Clackamas River in August and spawn in October and November (Cramer and Cramer 1994). The late run enters the Clackamas River from November to January. The outmigration of coho juveniles for the Clackamas River generally begins in April, peaks in May and June and is essentially over by early July. Historically, a second outmigration of smolts occurred in the fall, primarily during November (Cramer and Cramer 1994).

In the Clackamas River, approximately 568 km of potential coho habitat is currently available (93%) out of 613 km of historical habitat. In 2002, the escapement of coho was approximately 2,402 adults below North Fork Dam and 1,001 adults were passed above North Fork Dam. The portion of the population above North Fork Dam has a relatively low fraction of hatchery-origin spawners (12% HOR in 2002), while they dominate the area below the dam (78% HOR in 2002) (Waples et al. 2005). Since 2002, the number of coho adults passed above North Fork Dam has ranged from approximately 1,200 to 2,500, with no marked hatchery-origin fish passed above North Fork Dam (PGE 2007). Nearly 110,000 coho smolts passed the North Fork Dam in 2002.

The Clackamas River population above North Fork Dam is one of only two populations in the ESU for which natural production trends can be estimated. For coho above North Fork Dam, the long-term trends (1973 to 1998) have been slightly positive (1.080) and the short-term trends and growth rate (λ) estimates (1990-1998) have been slightly negative (0.884 and 0.902, respectively). Based on the stock assessment analysis that assumes the Clackamas River coho consist of two population components, Zhou and Chilcote (2003) concluded that the up-river component had a relatively low risk of extinction.

Overall, the Clackamas River population has experienced recruitment failure over the last decade. Abundance has been relatively low, placing the population in a range where environmental, demographic and genetic stochasticity can be significant risk factors (Waples et al. 2005). However, abundance has increased in 2005, 2006 and 2007 (personal communication, Todd Alsbury, ODFW). The harvest rate of natural-origin Clackamas River coho has been substantially reduced from 0.7-0.95 to ~0.12 in recent years by switching to a retention-only marked hatchery fish harvest and timing the fishery to protect natural runs (Waples et al. 2005).

The Clackamas natural population also includes coho salmon spawning in Willamette River tributaries below Willamette Falls, including Johnson, Abernethy, Tryon and Kellogg creeks. Coho were also documented in tributaries to Multnomah Channel from 1951 to 1959 (Willis et al. 1960). Presently, the biological community (including salmonids) within all of these tributaries has been greatly reduced from historical conditions due to degradation associated with agricultural and urban development.

Very little data is available for coho utilizing these tributaries separately from the Clackamas River population. Coho enter the tributaries in October and November depending on the timing of fall freshets. Peak spawning occurs in November.

Coho productivity, capacity and abundance have been assessed in Johnson, Tryon and Kellogg creeks using EDT. The total estimated capacity of these tributaries was 584 adults and the weighted average productivity was 1.64, with the bulk of the production in Johnson Creek. Johnson Creek coho adults migrated through and occupied lower, middle, and upper areas of the watershed; however, the best spawning habitat was believed to be in the upper watershed (Fulton, 1970). Observations of adult and juvenile coho in lower Johnson Creek and Crystal Springs suggests within population recruitment and production and/or use by other Willamette Basin populations. Coho salmon in middle Tryon and Arnold Creek primarily reflect low historical (and present) use of this portion of the subbasin for coho spawning and rearing.

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 River Coho are part of the Lower Columbia River Coho Salmon ESU, which was listed as Threatened under the ESA in 2005.
- **Population Description:** The Clackamas River Coho population is designated as a Primary population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004). The LCSR&SP describes the viability goal for this population as High+.
- **Recovery Goal for Abundance:** NA; the current abundance is 1,684, the viable abundance is 600 and the potential abundance is 4,000 (personal communication, Todd Alsbury, ODFW).
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity:** Lower river – Productivity: 1.8, Capacity: 700; Upper river – Productivity: 4.7, Capacity: 2202.

2.2 Current Hatchery Programs Affecting this Population

The Eagle Creek National Fish Hatchery segregated harvest coho program releases 500,000 coho salmon smolts (12 fpp) on-site at Eagle Creek (Rkm 16), a tributary to the Clackamas River from March through May (HGMP 2004). All juvenile coho salmon released into Eagle Creek are marked by an adipose fin clip (450,000), an adipose fin clip plus coded-wire tag (25,000), or a coded-wire tag only (CWT; 25,000 with no external fin clip). The historical parentage of coho salmon at Eagle Creek NFH is a mixture of Sandy River, Toutle River and Big Creek stocks, which were brought to the hatchery to initiate production of early-run coho salmon. Hatchery adults may spawn naturally in Eagle Creek below the hatchery and in Delph Creek.

Hatchery production dominates the Lower Columbia River coho salmon ESU. In 2002, the total expected return of hatchery coho salmon (including releases upstream of the ESU boundary) to the Columbia River basin was over a million adults (Waples et al. 2005). The paucity of naturally produced spawners in this ESU can be contrasted with the very large number of hatchery-produced adults. However, on the Oregon side of the Columbia River, the hatchery adults are generally concentrated in the Youngs Bay area in the estuary and in the vicinity of Bonneville Dam (personal communication, Todd Alsbury, ODFW). Although the scale of the hatchery programs and the great disparity in relative numbers of hatchery and wild fish produce many genetic and ecological threats to the natural populations, the BRT concluded that collectively these hatchery populations contain a great deal of genetic resources that might be

tapped to help promote restoration of more widespread naturally spawning populations (Waples et al. 2005).

There are no coho programs within the lower Willamette River tributaries. There is little evidence of marked hatchery coho straying into these tributaries (personal communication, Todd Alsbury, ODFW).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: Lower Clackamas: 780 fish; Upper Clackamas: 0 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 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 0.8 to 1.5 in the lower Clackamas and remain the same in the upper Clackamas. Average abundance of natural origin spawners (NOS) would decrease in the lower Clackamas from approximately 284 fish to approximately 211 fish and remain the same in the upper Clackamas. Harvest contribution of the natural and hatchery populations would go from approximately 4,685 fish to approximately 324 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

Lower Clackamas River Population Component (downstream of River Mill Dam)

The lower river population component of coho is dominated by hatchery-origin spawners. Recent spawning surveys for coho in tributaries of the lower Clackamas River (2002-2004) estimated that hatchery fish constituted 37 to 77% of all natural spawners. The coho program at Eagle Creek National Fish Hatchery (500,000 smolts) is operated consistent with a Stabilizing designation for the lower river population component. The current hatchery program would not be consistent with either a Primary or Contributing designation for the lower Clackamas coho population component. Under current habitat conditions, an integrated hatchery program could not be supported; however, with improved habitat conditions, an integrated program may be feasible.

Upper Clackamas River Population Component (upstream of North Fork Dam)

The upper Clackamas River is managed for wild fish production. All marked hatchery-origin coho are excluded from the upper river at North Fork Dam. In recent years, very few hatchery-origin coho have been intercepted at North Fork Dam. For example, from 2004-2005, only two marked adult coho were intercepted each year at the dam. Consequently, there appears to be little or no straying of hatchery-origin coho into the upper Clackamas River. Because all marked hatchery-origin coho are excluded from the upper river, the hatchery program in the lower river (Eagle Creek NFH) is operated consistent with a Primary population designation for the upper river population component.

Recommendations

Lower River Population Component

Managers should consider whether harvest goals could be met with a smaller program at the Eagle Creek NFH. The current program is based on an on-station release of 500,000 yearling smolts. If recovery goals for the lower Clackamas River are developed in the future, the hatchery program will need to be managed consistent with those goals.

Managers should also consider developing an integrated hatchery program to replace the current segregated program in the lower river after habitat conditions are improved and the lower river is capable of supporting a viable, self-sustaining population. Reducing on-station releases would also reduce the proportion of natural spawners composed of hatchery-origin fish. Unlike the current program which uses an introduced non-Clackamas River stock, an integrated hatchery program could provide both conservation and harvest benefits.

Upper River Population Component

The HSRG offers no specific recommendations for modifying this population component.

Table 1. Results of HSRG analysis of current condition and HSRG Solution for Clackamas River Coho. 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	L Clackamas None	-	0%	0%	69%	0.00	284	0.8	53	0
	U Clackamas None	-	0%	99%	0%	1.00	1,538	3.9	288	0
	Seg Harv	349.1	85%						4,344	2,214
No Hatchery	L Clackamas None	-	0%	0%	0%	1.00	211	1.5	40	-
	U Clackamas None	-	0%	99%	0%	1.00	1,538	3.9	288	-
HSRG Solution	L Clackamas None	-	0%	0%	66%	0.00	266	0.8	50	0
	U Clackamas None	-	0%	95%	0%	1.00	1,533	3.9	290	0
	Seg Harv	349.1	85%						5,379	1,371
HSRG Solution w/ Improved Habitat	L Clackamas None	-	0%	0%	63%	0.00	297	0.8	56	0
	U Clackamas None	-	0%	95%	0%	1.00	1,739	4.3	329	0
	Seg Harv	349.1	85%						5,379	1,371