Catherine Creek Spring Chinook Salmon Hatchery Supplementation Program Review

Catherine Creek Supplementation

III. KEY FINDINGS

ISRP comment page 48: *"Are hatchery smolts larger than natural smolts?"*

Response: Hatchery smolts are released at a larger size than natural origin smolts. Typical mean length at release for hatchery smolts is 115 mm while the natural fish average 87 mm.

ISRP comment page 48: *"Are some fish migrating downstream as subyearlings in the fall and winter? How does early emigration affect survival rates? Are early emigrants less successful after accounting for their young age compared with smolts?"*

Response: We have observed that about 40% of parr produced in Catherine Creek migrate downstream into the Grande Ronde Valley low gradient habitat in the fall and early winter for the 1993-2007 brood years. The fall migrants overwinter in Catherine Creek and the Grande Ronde River and begin seaward migration in the spring. Significant overwinter mortality occurs for both life history types, those that redistribute downstream and those that remain in upper Catherine Creek. We have not observed a consistent significant survival advantage to the smolt stage at Lower Granite for either life history type.

ISRP comment page 48: *"What percentage of propagated releases are visually marked or tagged?"*

Response: We attempt to mark/tag 100% of the releases. A small proportion (less than 3%) has poor marks at release and may not be recognizable at return.

ISRP comment page 48: *"Is broodstock the sole reason for lower straying?"*

Response: We hypothesize that the broodstock origin and release strategies (tributary locations and acclimation) are all factors that have contributed to reduced straying.

ISRCP comment page 48: *"Is Catherine Creek a situation where interbreeding of hatchery and wild fish reduces survival of the spawning fish but continued introduction?"*

Response: We have too few years of information to conclude that the interbreeding of hatchery and wild fish is reducing productivity. However, early results of the relative reproductive success indicate hatchery fish are performing about 75% as well as natural origin fish. We did conclude in our paper, "We have increased the total number of natural spawning fish with the addition of substantial numbers

of hatchery returns to the spawning grounds. The hatchery program is providing a demographic boost that appears to be critical in preventing the population from going extinct."

ISRP comment page 48: *"Is the decline in smolts per spawner associated with reduced growth of smolts suggesting food limitations?"*

Response: There is a significant negative relationship between parr abundance and parr-to-smolt survival, thus the decline in smolts per spawner does appear to be strongly associated with parr abundance. We also observed a significant negative relationship between parr abundance and fall migrant size and fall migrant size and survival to smolt. Although we are uncertain of the mechanisms driving these relationships, the food availability hypothesis seems very reasonable.

ISRP comment pages 48-49: *"If hatchery females carry fewer eggs, on average, to what extent does this influence the smolts per spawner relationship in Fig. 16? What influence does average female age have on Fig. 16? Is fecundity at age available for this stock?*

Response: Hatchery females do not have lower fecundity at age; however, since their average age is slightly less than natural fish the average fecundity is slightly lower. Age composition of females varies considerably from year to year; however, average age of female spawners is reduced slightly in this supplementation program. The overall influence on smolts per spawner is minimal because the denominator is all adult spawners and the decreased fecundity is not great. We are collecting fecundity by origin and age. To date sample sizes are limited; however, Age 5 females have greater fecundity than Age 4 and we have not seen a difference by origin.

ISRP comment page 49: *"Hatchery strays have been quite low in the Minam and Wenaha rivers since 2002. How does the survival of smolts from these two systems (to LGD and overall) compare with that of Catherine Creek and the Upper Grande Ronde where supplementation is high?"*

Response: We do not have smolt survival data for the Wenaha to use for comparisons. We recently completed a comparison of survival rates and provide the results comparing Catherine Creek and the Minam River to address the above comment. These results are from the 2000-2005 brood years for SARs and 2000-2008 brood years for egg-smolt.

	Minam River	Catherine Creek
Egg-to-summer parr	32.7%	24.4%
Parr-to-tributary smolt	23.0%	19.4%
Tributary smolt-to-LGD smolt	56.0%	41.8%
SAR-tributary smolt-to-spawner	1.4%	0.5%

Survival in Catherine Creek is lower than the Minam for all life stages. Of specific concern is the lower survival for the smolts from the tributary to Lower Granite Dam and smolt-to-adult spawner. We are uncertain of the mechanisms driving these differences. However, we believe that environmental conditions and predation in the migratory route, distance to Lower Granite Dam, smolt size, as well as smolt condition are all factors influencing smolt-to smolt survival and SARs. We have initiated focused investigations to better understand the key factors influencing the poor performance for Catherine Creek.

ISRP comment page 49: *"Do these two rivers (Minam and Wenaha) show strong density dependence relationships? Is the ratio of recruits per spawner greater than 1? How do these populations persist when so few hatchery fish spawn in the rivers?*

Response: We do not have adequate data to assess density dependence in the Wenaha River. We have not observed a strong signal of density dependence for any life stage in the Minam River population. The ratio of recruits per spawner has averaged below 1.0 for the most recent ten completed brood years for the Minam and Wenaha populations. However, there have been some years in the time series that have been well above 1.0. The populations are on a slow long-term decline with the high productivity years boosting the populations up periodically. Overall the productivity of the Minam River and Wenaha River populations is primarily limited by smolt-to-adult survival, which is regulated by dam and reservoir mortality as well as ocean survival.