(Feasibility of Reintroduction of Anadromous Fish Above or Within the Hells Canyon Complex)

Existing Habitat Conditions of the Mainstem Snake River Formerly Used by Anadromous Fish (E. 3.1-2, Chapter 5)

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I. Introduction

This chapter reviews the historic distribution of anadromous fish in the mainstem Snake River above HCC, as well as the water quality and spawning habitat quality found there today. Fall chinook salmon are the primary focus of this chapter because they used the mainstem river extensively while very few of the tributaries miles above HCC were occupied.

II. Conclusion

1. "Anadromous fish continued to persist in the mainstem below Swan Falls Dam [until HCC was closed]*, but spring chinook and steelhead were noticeably declining because of tributary dams and intensive land uses." (Page 3, Paragraph 2)*

Response:
The BLM agrees with this statement.

2. "The Hells Canyon Complex (HCC) inundated approximately 93 mi (150 km) of Snake River habitat and blocked access to approximately 118 mi (190 km) of free-flowing Snake River up to Swan Falls Dam. A total of 211 mi (340 km), or 34%, of mainstem Snake River habitat was lost. This loss plus the loss above Swan Falls Dam accounted for approximately 59% of Snake River mainstem habitat (Figure 2)." (Page 3, Paragraph 4)

Response:
The BLM agrees with this statement.

3. "Loss of fall chinook habitat may be better expressed in terms of river miles of productive spawning habitat rather than total river miles. Recently, Battelle Pacific Northwest Labs and the U.S. Geological Survey (Battelle and USGS 2000) jointly assessed mainstem fall chinook salmon habitats in the Columbia River basin. For the assessment, they created a fall chinook spawning habitat model. The model developed a geomorphic template of spawning areas based on geomorphic features, such as river gradient (<0.05%), underlying geology (presence of 50% unconsolidated material), and presence of islands and bars—features that are present in known large contiguous spawning areas. They concluded that historically, approximately 58% of high-production potential spawning habitat in the Snake River existed above the present-day Hells

Canyon Dam site, and 42% existed below the site. The four lower Snake River dams inundate much of that potential, high-production spawning habitat below Hells Canyon Dam." (Page 4, Paragraph 2)

Response:
The BLM agrees with this statement.

4. "Most of the historic high-production habitat that Battelle and the USGS identified in the upper Snake River above Hells Canyon Dam occurs within the reach from Swan Falls Dam (RM 458) to the upper end of Brownlee Reservoir (RM 335). Actual redd counts in the years immediately before construction of Brownlee Dam show that the majority of spawning occurred between Swan Falls Dam and Marsing, Idaho (RM 425), and that very little spawning occurred between Marsing and the upper end of Brownlee Reservoir (Richards 1959). The river downstream of Marsing has a different thermal regime than the river upstream of Marsing. The thermal regime downstream is influenced by several large tributaries that enter the Snake River, including the Boise, Owyhee, Payette, and Weiser rivers. The thermal regime upstream is influenced by the spring discharges into the Snake River near the town of Hagerman, Idaho, discharges that buffer summer maximum and winter minimum temperatures. Historical accounts by Evermann (1896) and early explorers suggest that the areas above Swan Falls provided some of the largest and most important spawning grounds in the Snake River." (Page 4, Paragraph 3)

Response:
The BLM agrees with this concept. It is theorized that the Marsing Reach near Thousand Springs, Idaho was an area of concentrated fall chinook salmon spawning due to the moderate winter temperatures. The springs maintained a constant temperature that was warmer than other reaches of the Snake River and may have resulted in higher survival rates.

5. "We further theorize that the construction of Brownlee Dam enhanced the overwinter thermal regime in this reach, increasing the potential for successful incubation of fall chinook salmon. This theory is further explored in Section 3.0 of this chapter." (Page 5, Paragraph 2)

Response:
The BLM believes that this theory should be reviewed by the fisheries agencies to determine whether they agree with the Applicant. Previously, fisheries agencies have theorized that colder water caused by the Hells Canyon Complex during the incubation period delayed egg development and may have caused delayed out-migration. NMFS believes that late outmigration from the Hells Canyon Reach results in higher than normal mortality.

6. "Slower migration rates through reservoir environments increase both the risk of exposure to warming temperatures and the risk of predation. Connor (2001) concluded that increases in flow and decreases in water temperature increase salmon smolt survival. If water temperatures rise too quickly to levels approaching 20 °C, fish survival

can be negatively affected by reduced physiological processes, which in turn increase vulnerability to predation, stress, and disease (Connor 2001, McCullough 1999)." (Page 14, Paragraph 2)

Response:
The BLM agrees with this statement. The combination of the eight Columbia and Snake river reservoirs combined with the three HCC reservoirs may reduce survival of migrating fall chinook salmon smolt to a level below the replacement threshold. It has been generally knowledge that approximately 8% of smolt die passing each dam. The more dams they must pass, the higher the cumulative loss. If this is true, then the population could only be sustained by hatchery supplementation.

7. [The Marsing Reach and other spawning areas above HCC are heavily polluted by phosphate and nitrogen that causes excessive aquatic plant growth. Extensive sedimentation of the spawning gravel from agricultural and other non-point source run-off has resulted in the major spawning areas being classified by the State of Idaho as being water quality impaired. The lack of scouring flows in the springtime due to water diversions has reduced the river's ability to clean the sediment from its bed.] [This text is paraphrased] (Pages 17 -34)

Response:
Additional studies are needed to verify the ability of fall chinook salmon to reproduce in the Marsing Reach.

8. [Spawning gravel testing conducted by creating and monitoring artificial redd sites were inconclusive. Oxygen levels during early incubation appeared to be adequate. Dissolved oxygen levels may not be adequate during post-hatching when pre-emergent fry require more oxygen.] [This text is paraphrased] *(Page 38, Paragraphs 3-6)*

Response:
Additional studies are needed to verify the ability of fall chinook salmon to reproduce in the Marsing Reach. The IPC intragravel oxygen flow studies were inconclusive, but they did not indicate that fall chinook salmon eggs and fry could not survive.

III. Study Adequacy

The BLM believes that additional studies of egg to fry survival are needed before this study is considered adequate. The Applicant's study provides information concerning the historic and present condition of the fall chinook salmon spawning habitat in the mainstem Snake River above HCC. The Applicant lists numerous problems that are likely to prevent fall chinook salmon from being successfully reintroduced into their former habitat above HCC. However, their study leaves unanswered questions concerning the survival of eggs to emergent fry as well as fry to smolt. IPC could conduct studies using fall chinook eggs to determine actual survival rates from gravel to emergence. Using radio tags, additional studies of migrant smolt behavior and survival could be conducted to determine migration timing through the present reservoir system of the Snake and Columbia rivers.

IV. BLM Conclusions and Recommendations

Conclusions

The Applicant's study extensively documents the habitat degradation that fall chinook salmon face, if they are reintroduced to their former habitat in the mainstem Snake River above the Hells Canyon Complex. The Applicant failed to provide conclusive information that fall chinook salmon can not reproduce in their historic spawning areas. Their current information strongly supports the proposition that it is unlikely that fall chinook salmon could be reintroduced above Hells Canyon Complex and sustain a population without hatchery supplementation. Cumulative smolt and adult losses passing the dams of the Columbia and Snake rivers may be too high to sustain wild populations. Example: Assuming an 8% loss at each dam from Brownlee to Bonneville (11 dams) a cohort of 1000 smolt would result in only 399 surviving to the estuary. Subsequent losses in the ocean and return to pass eleven dams would leave few if any surviving to reproduce.

Recommendations

IPC should conduct spawning ground and migration studies using surplus hatchery fall chinook salmon adults and eggs to determine survival rates from egg to smolt. They should conduct timing studies on smolt produced in the Marsing Reach to determine whether they would reach the dams in the Hells Canyon Complex before water temperatures become too high for their survival. They could also conduct smolt to adult survival studies, but this would require a minimum of five years.