Project ID: 31032

Develop a Well Water Supply System for the Hardy Creek Chum Salmon Spawning Channel

Responses to ISRP Comments

The initial statement notes that the Fish and Wildlife Service is requesting $152.5k for this project. Further discussion with well drilling companies indicates that costs for well drilling could be reduced 25 to 30% by drilling several smaller diameter wells instead of a single larger one. The initial well drilling cost of $75k could be reduced by $22.5k to $52.5k. Pump costs would also be reduced by $5k from $27.5k to $22.5k. The revised total project cost would be $119.8k.

As we noted in our February 22 presentation to the ISRP, the Fish and Wildlife Service intends to fund a portion of this cost. We estimate that the Fish and Wildlife Service could provide $50k of the total cost. The revised request for Bonneville Administration funding would be $69.8k.

Comment 1) Chum did not use the channel in 2000 due to drought, but did chum enter the channel during 2001? How did they distribute through the channel?

Response: Chum salmon did enter the spawning channel during the 2001 spawning season. It appears that chum salmon spawned in the upper reach of the channel during 2001. One redd and a dead male and a dead female chum were found during spawning channel surveys. This redd was located near the upper end of the spawning channel. Fish and Wildlife Service staff are monitoring the spawning channel to determine the time of fry emergence.

It appears that conditions at the entrance to the channel its lower reach could be improved to provide better entrance conditions for chum. As was described at the February 22 presentation to the ISRP, the Fish and Wildlife Service intends to correct this condition during 2002. Fish and Wildlife Service staff will survey known chum salmon spawning areas for stream gradient, water velocities, and substrates to determine the physical characteristics of these sites. This information will be used to develop one dimensional (PHABSIM) and two dimensional (River 2-D) models of the spawning channel entrance and its lower reach so that proper modifications can be made before the 2002 spawning season. These improvements should result in more chum salmon entering the spawning channel. Distribution of chum salmon in the spawning channel and spawning success will continue to be monitored in future years.

Comment 2) Is there any concern regarding the removal of 1,000 gallons per minute on proximal streams, especially Hardy Creek? Is there any concern for acquiring the Water Right? The volume to be pumped is large, how was this volume determined?

Response: Yes, there was concern about the removal of 1,000 gallons per minute for the well. The Fish and Wildlife Service investigated an alternative that would have involved excavating a trench near the Columbia River and pumping Columbia River water from the trench to supply the channel. The cost for this alternative would have been much higher than for a well. Information provided by well drilling companies we have contacted indicates that the Columbia River elevation would be reached by drilling of a well. Water would be drawn from gravels at the elevation of the Columbia River rather than from surface water that feeds Hardy Creek. Hardy Creek and other nearby streams should not be impacted.

Yes, there is concern for acquiring a Water Right since there is no guarantee that a right will be issued. We have contacted the Fish and Wildlife Service's Water Rights office staff who indicated that no difficulties were anticipated in obtaining a water right for this project. The water right would be obtained for a supplemental and non-consumptive use of water that would favor its issuance. Water from the spawning channel would supply Hardy Creek and the Columbia River system after leaving the spawning channel.

The volume of water to be supplied is about 1,000 gallons per minute (gpm) or about 2.2 cubic feet per second. The design flow for the spawning channel is 5 cubic feet per second. A flow of 2.2 cfs was estimated to be sufficient to maintain water over most redds and to keep water in the channel from freezing.

We would initially drill a test well to determine the quantity and quality of water available. As was discussed above, drilling of several smaller wells would be less expensive than drilling a single large well. The test well would be used as the first of three smaller wells, each of which would be expected to yield about 300 gpm. We would initially supply the spawning channel with 300 gpm and evaluate its effectiveness in protecting potential redd areas. Drilling of additional wells would be based on the results of this evaluation. The final volume of water that is pumped for the channel would be less than 1,000 gpm if testing reveals that a smaller volume is sufficient.

Comment 3. Water temperature of the well water is likely to be warmer than surface water. Has there been any assessment of the potential effect on rates of egg development and emigration of chum fry?

Response: Yes, warmer water temperatures in the well water supply were considered in developing this proposal. Investigations of chum salmon spawning sites in the Columbia River have shown that chum salmon select sites where upwelling occurs. Geist et al., (2001) found that chum salmon in the nearby Ives Island reach of the Columbia River spawned where warmer water from the hyporheic zone upwelled. They noted that riverbed temperatures were 7 to 11 degrees C. warmer than the river itself.

Fish and Wildlife Service biologists have monitored water temperatures in Hardy Creek and Hamilton Springs and found that the temperature of upwelling water at chum redd sites was higher than that of the ambient water. Redd water temperatures were from 0.1 to 3.1 degrees C. higher than ambient water temperatures. Water temperatures at Hardy

Creek redds ranged from 5.3 to 8.6 degrees C. and ranged from 5.6 to 9.7 degrees C. at Hamilton Springs. It appears that the temperature differences between redds in both Hardy Creek and Hamilton Springs were greater than the differences between the redds and ambient waters.

Warmer well water would simulate the temperature difference that occurs naturally in chum salmon spawning areas. This warmer water would also prevent spawning channel water from becoming too cold and help to maintain an incubation rate similar to that of chum salmon in Hardy Creek.

Reference: Geist, D.W., T. P. Hanrahan, E.V. Arntzen, G.A. McMichael, C. J. Murray, and Y. Chien. 2001. Physicochemical characteristics of the hyporheic zone affect redd site selection of chum and fall Chinook salmon, Columbia River, 2001. Report to the Bonneville Power Administration, Contract No. 00000652, Project No. 199900304. BPA Report DOE/BP-00000652-5. 26 p.

Comment 4) What is the basis of water supply system proposed and is there any experience in the construction of artificial upwelling for chum spawning? Is there any evidence chum will use this design?

Response: The proposed water distribution system is based on observations of fisheries research biologists who have been studying lower Columbia River ESU chum salmon at spawning sites. In nearly all cases chum salmon preferentially selected spawning sites where upwelling occurred.

To our knowledge, there has been no previous installation of an artificial upwelling system for chum salmon spawning. The artificial upwelling system has been proposed as an innovative project that could increase the availability of spawning sites in artificial channels. If successful, such a system could allow for the construction of additional spawning channels that are outside of existing stream channels. We have also proposed that spawning success in sections of the spawning channel that are supplied with the artificial upwelling system be compared to similar sections of the channel that do not have the artificial upwelling system. This study would be conducted as a task under Project 2000-012-00.

Comment 5) Is there any management plan for the chum spawning populations in the Hardy Creek-Ives Island group (i.e. will the channels be loaded as a priority or will use be voluntary by the chum salmon?)

Response: Initially, chum salmon will be allowed to enter the spawning channel voluntarily. Our intent is to have the channel colonized by chum that enter voluntarily and that their progeny will return to the channel to spawn.

A trap has been installed in the channel to count the number chum salmon entering the channel and to control the number of fish using the channel.

Additional ISRP Comment regarding modifying the slope of the lower river to encourage fish to move above the area that is subject to frequent (every 2 to 5 years) flooding by the backwater effect of the Columbia River.

Response: Stream surveys conducted by Fish and Wildlife Service staff indicate that most of the suitable spawning habitat for chum salmon occurs in the area subject to frequent flooding. The stream gradient and substrate composition change upstream of the reach where most spawning occurs. Some chum salmon do migrate as far as 100 meters upstream of the 2 to 5 year flood elevation, but the area of suitable spawning habitat is very limited.

The Fish and Wildlife Service has proposed that the slope of the lower section of the spawning channel be modified to encourage fish to move into the channel. The channel is entirely above the 2 to 5 year flood elevation. The spawning channel would have considerably more suitable habitat than is available in the 100 meters of Hardy Creek above the 2 to 5 year flood elevation.