Response to ISRP Preliminary Recommendation and Comments:
project number 29030
"Early life history and survival of spring chinook salmon and steelhead in the Methow River Basin"

ISRP comment: A response is needed. Habitat selection by hatchery fish is likely not representative of habitat use of wild fish. The proposal focuses on survival overwinter, when major mortalities of juveniles are thought to occur. The objective is to identify features of the habitat that might be enhanced to improve survival. It is questionable whether they will be able to locate 500 wild juvenile spring chinook for tagging during the winter in the Methow River, as proposed on page 4. To find that many in different habitat types may be stretching it too far.

Reply: Obtaining a valid sample size of fish is a priority for this study. This is why augmentation with either hatchery or wild fish has been suggested as a back up. While we have an augmentation plan to supplement our sample sizes, there is a high likelihood that large numbers of juvenile fish can be captured during the fall and winter in both the Chewuch and Twisp rivers. Snorkeling surveys done in the Chewuch River during August and September of 1993 and 1994 provide population estimates of both spring chinook salmon and steelhead / rainbow trout juveniles (Hubble and Sexauer 1995). In a large stretch of the Chewuch River (river miles 2.3 – 23.3) large numbers of juvenile spring chinook salmon were found in both 1993 (230-272 fish per river mile) and 1994 (105-438 fish per river mile). The lower 24.6 river miles of the Chewuch River were estimated to contain between 59 and 625 steelhead / rainbow trout per river mile in 1993 and between 40 and 178 in per river mile in 1994. It is expected that the numbers of juveniles in these areas will be much higher during the next two years due to returns of adults that were (are) much higher than in 1992 and 1993 (Figures 1 and 2). Counts at Rocky Reach dam indicate that adult spring chinook salmon returns in 2001 (from which yearling offspring will be present this coming fall (2002)) were 3.5 – 5.5 times higher than 1992 and 1993 counts (Figures 1 and 2). Counts at Rocky Reach Dam also indicate that adult steelhead returns in 2001 (from which yearling offspring will be present this coming fall (2002)) were 3 – 8 times higher than 1992 and 1993 counts (Figure 1 and 2).

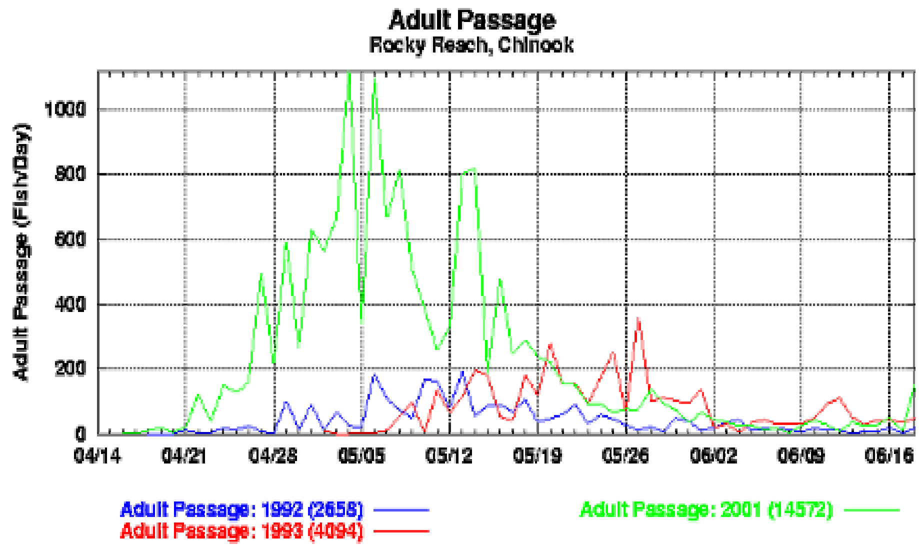

Figure 1. Counts of adult spring chinook salmon over Rocky Reach dam for the years 1992, 1993 and 2001.

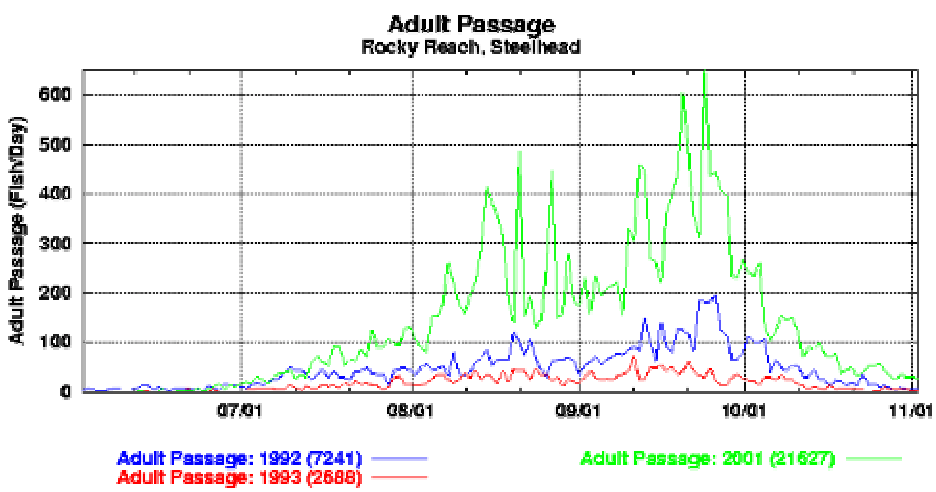

Figure 2. Counts of adult steelhead over Rocky Reach dam for the years 1992, 1993 and 2001.

Numbers of redds in the Chewuch and Twisp rivers also indicate that numbers of juvenile spring chinook salmon are likely to be much higher this coming year and the next year. The numbers and distribution of spring chinook salmon and steelhead in the Methow drainage are representative of the abundance and distribution of redds (Joel Hubble, YN, personal communication). A summary of redd counts in the Chewuch River shows that 173 and 75 spring chinook salmon redds were found in the lower 23 miles of the Chewuch River in 1992 and 1993 respectively (Hillman and Miller 1994). Last year about 1,100 redds were found in the Chewuch River, as compared to numbers less than 20% that number in 1992 and 1993 (Joel Hubble, YN, personal communication). In the Twisp River, there were also large numbers of spring chinook salmon redds found last year (400 redds; Joel Hubble, YN, personal communication).

Our purpose for including hatchery fish in this study was to supplement the numbers of fish to determine survival. Another option, suggested by Yakama Nation biologists, is to use wild salmon captured earlier in the year. Under this plan, wild juveniles would be caught in late summer (August). They could be held at the nearby Winthrop federal fish hatchery. These fish would then be released into the river during the fall to supplement sample sizes of wild fish. Each fish would be individually identifiable (PIT tags), enabling us to determine whether there were differences in behavior/survival of wild fish that had been held versus those that had not. If no differences were found, held and unheld wild fish samples could be grouped to increase sample sizes. If differences were detected, the two groups would be analyzed separately.

ISRP comment: As suggested on page 7, observed abundance may be related to habitat where warm groundwater infuses into the stream. This may not be indicative of true relative abundance because it has been observed that salmon juveniles may burrow into the substrate during the winter, where they would be difficult to sample. How will the above problems be overcome?

Response: It has been well documented that juvenile salmonids hide in the substrate during winter (Hartman 1965; Griffith and Smith 1993). However, it is also well documented that this is a diel behavior (Fraser et al. 1993; Griffith and Smith 1993; Thurow 1997). Fish hide in the substrate during the day and come out from cover at night. Thus, a primary sampling technique during winter will be night sampling. However, some sampling could be conducted during the day since some salmonids also tend to remain in the water column at this time. In fall and winter, juvenile salmonids can be found in large aggregations during the day (Cunjak and Power 1986); for example Hillman et al. (1987), noted up to 250 spring chinook salmon in some aggregations. Also, spring chinook salmon have been found to use dense cover along undercut banks during cold winter periods (Hillman et al. 1987).

ISRP comment: The proponents need to give more consideration to the overall sampling plan for selection of "study sites" and "sub-sampling for fish or habitat points" to observe. Is the "sample size" that will allow statistical inferences to the entire area the number of study sites, or the number of fish? Will sites be selected by a probabilistic method allowing statistical inferences to entire stream reaches, or is the plan to use more of a controlled "study" where sites are subjectively selected to represent different environmental conditions. Also, more consideration should be given to the required "sub-sample sizes" for the number of fish to observe in each task.

Reply: The sample sizes that will be considered adequate vary depending on the aspect of this study. When studying habitat selection, it is very unlikely that numbers of fish will be problematic (please see response to first comment). Fish can be examined over the entire winter in several areas. Fish that will be recaptured to determine survival will be caught in rotary screw traps at the end of the winter. The number of fish that will be recaptured may only be a small percentage (~ < 30%) of the actual population. Thus, having adequate sample sizes is likely to only be a concern for the survival aspects of this study. For this reason, extensive efforts will be made to PIT tag large numbers of individual fish.

For the survival aspects of the study, sites will be selected on different scales and using different methods. On the largest scale, sample areas will not be chosen randomly (using a probabilistic method). Instead they will be chosen broadly, based on the quality of habitat available. Initial study plans have focused on the lower half of the Chewuch River, and the middle and lower portions of the Twisp River. Overwintering habitat is thought to be best in the middle reach of the Twisp River. The habitat is thought to be better ('moderately good') in the lower half of the Chewuch River and relatively 'poor' in the lower section of the Twisp River. A comparison of survival among these three sections may identify the influence of habitat quality factors. We admit that we may encounter a major challenge in attempting to collect ample sample sizes in an area like the lower Twisp River where habitat is thought to be relatively poor. However, we are willing to deploy a large amount of effort to try to achieve a meaningful sample size (please see reference to night sampling in response to second comment).

This protocol was selected to increase the likelihood that robust survival estimates can be made. Large numbers of individual fish will be tagged within each of these areas, and the relative survival of individuals from each area will be determined in the spring. Thus each individual is a sample, and the percentage of individual fish surviving will be compared among the three reaches.

Survival will also be examined at finer scales. For example, individual fish will be tagged in a number of different randomly chosen macrohabitat types (pools, riffles, runs; a stratified random sample). The relative survival of individual fish in different macrohabitat types will be examined. Since these habitats are sampled using a random protocol, they will be used to represent entire reaches. Each individual is a sample, and the percentage of individual fish surviving will be compared among different macrohabitat types. This may provide a finer scale link between survival and habitat quality. Since the comparison of survival in each macrohabitat type will be a sub-sample of the fish tagged in an entire reach, the sample sizes will decrease. If we examine survival on a finer scale (for example comparing survival among pool types) the number of individuals tagged and recaptured from each different habitat type examined will decrease even further. Thus the likelihood of finding meaningful differences in survival decreases as the scales of analysis become finer. This is why we are choosing to sample on several scales. This will increase the probability of producing meaningful results on at least some scales. Scales with low sample sizes will be targeted for increased effort, and increased sample sizes in subsequent years.

References

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