Hells Canyon
Instream Flow Assessment
(E.2.3-2)

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I. Introduction

The purpose of the instream flow assessment is to examine the relationship between instream flows and aquatic habitats of white sturgeon and native salmonid life stages in the Snake River below Hells Canyon Dam. Idaho Power Company used an integrated approach that coupled river process simulations with aquatic resource studies to provide a database that not only allowed them to describe the relationship between flow and aquatic habitats, but also allowed them to compare Hells Canyon Complex operational scenarios across a wide range of hydrologic conditions. *"A primary objective of this assessment was to compare relative effects of two operational scenarios for the HCC on habitat for the 10 target species/life stages." (Page 77, Paragraph 4).*

The applicant modeled the affects of two flow scenarios: *Run-of-River Full Pool* and *Proposed Operations* for five flow years 1) extreme low, 2) low, 3) medium, 4) high, and 5) extremely high on ten target species/life stages of native fish. The modeling provides a comparison of the relative affects of each scenario's positive and negative affects. The comparisons show the relative differences between the scenarios but are not absolute (real) values.

The applicant used an integrated model that included: 1) a two-dimensional (2D) flow model calibrated at seven sites in the Hells Canyon Reach, 2) a one-dimensional (1D) hydrodynamic flow model, and 3) a detailed digital terrain model (DTM) for modeling rearing habitats for juvenile fall chinook salmon in the 102 miles of river below Hells Canyon Dam. The 2D model was used to expand the information from the seven 2D calibration sites to the entire reach based on the geomorphic features of the river channel.

II. Conclusions

1. "Modeled habitat for white sturgeon spawning in the HC Reach increased with flow throughout the range of modeled discharges and was the highest in availability of any sturgeon life stage. Modeled spawning habitat, as a percentage of total reach area, increased steadily from 16% at 5 kcfs (or 5,000 cubic feet per second) to 79% at the maximum modeled discharge of 100 kcfs." (Page 1, Paragraph 3)

Response: The BLM agrees with the results produced by the model. The current studies that indicate a healthy white sturgeon population support this finding.

2. "Modeled habitat in the HC Reach for white sturgeon incubation increased sharply with discharge up to 30 kcfs and then decreased steadily through the remaining modeled discharges." (Page 1, Paragraph 3)

Response: The BLM agrees with this finding. Existing white sturgeon research tends to support the logic of this modeled finding.

3. "Modeled habitat for white sturgeon larvae in the HC Reach showed nearly the same relationship with discharge that the incubation life stage exhibited." (Page 1, Paragraph 3)

Response: The BLM agrees with this finding. Existing white sturgeon research tends to support the logic of this modeled finding.

4. "Modeled habitat availability for the early white sturgeon life stages (spawning, incubation, and larvae) was proportionate to the magnitude of hydrologic year in the HC Reach." (Page 1, Paragraph 3)

Response: The BLM agrees with this finding. Existing white sturgeon research tends to support the logic of this modeled finding. It is known that white sturgeon in the Columbia and other rivers have higher spawning success in years of high flow.

5. …."Proposed Operations and Run-of-River Full Pool (RRFP) Operations--showed that Proposed Operations reduced modeled habitat for these early life [spawning, incubation, and larvae] stages during extreme low and low flow years." (Page 1, Paragraph 3)

Response: The BLM agrees with this finding. White sturgeon need high flows to have good reproductive success. Extreme low and low flow years can be expected to reduce their habitat and reproduction success. Hydropower proposed operations would store water during low years and reduce the higher flows needed for reproductive success.

6. "Proposed Operations also impacted modeled habitat for the spawning life stage during medium high and extreme high flow years." (Page 2, Paragraph 1)

Response: The BLM agrees with this finding. The flood control measures and hydropower proposed operations storage of water during high water years reduce the high flows needed for sturgeon reproductive success.

7. "Modeled habitat in the HC Reach for the young-of-the-year (YoY) white sturgeon life stage remained relatively unchanged with discharge...." (Page 2, Paragraph 2)

Response: The BLM does not agree with this finding. This is an unsupported assumption. White sturgeon researchers did not capture fish of this age class. Therefore, their behavior and habitat could only be assumed when building the model. The fact that there

is generally good reproduction would indicate that the habitat is adequate in the Hells Canyon Reach under current operations, but there is no real way of knowing how their specific life stage is affected by discharge.

8. "The availability of modeled juvenile white sturgeon habitat changed little with discharge in the Snake River below HC Dam...." (Page 2, Paragraph 2)

Response: The BLM does not agree with this finding. This is an assumption. White sturgeon researchers did not capture fish of this age class. Therefore, their behavior and habitat could only be assumed when building the model. The fact that there is generally good reproduction would indicate that the habitat is adequate in the Hells Canyon Reach under current operations, but there is no real way of knowing how their specific life stage is affected by discharge.

9. "The availability of adult white sturgeon habitat modeled in the HC Reach was essentially equal between Proposed Operations and RRFP Operations across the five hydrologic years." (Page 86, Paragraph 3)

Response: The BLM agrees with this finding. The numbers generated by the model are not significantly different.

10. "The protective flows of the fall chinook program (initiated by IPC in 1991) under the Proposed Operations scenario provide near-maximum habitat availability to spawning fall chinook." (Page 2, Paragraph 3)

Response: The BLM agrees with this finding. However, water quality issues associated with the HCC may negate the benefit to the initial survival associated with these flows. The cold water produced by HCC delays emergence and subsequent migration. NMFS studies of test groups of fall chinook smolt indicate that late migrants have very poor survival.

11. "Modeled fall chinook spawning habitat available under Proposed Operations exceeded habitat available under RRFP Operations during all five hydrologic years analyzed." (Page 2, Paragraph 3)

Response: The BLM agrees with the model finding. The proposed operation scenario will regulate spawning and incubation flows to provide optimum habitat while the RRFP scenario does not.

12. "Our 2D modeled estimate of fall chinook juvenile habitat showed that there was no difference between the two operational scenarios during the extreme low and low flow years. Modeled habitat was increased under Proposed Operations an average of between 19.6% and 44.7% during the medium, high and extreme high flow years." (Page 2, Paragraph 5)

Response: The BLM agrees with this finding. The proposed operation scenario will control peak flows that could adversely affect fall chinook embryos and emerging fry. The RRFP scenario would exert less control on high flow events which could result in gravel movement and loss of eggs and fry.

13. "Modeled habitat for redband trout in the HC Reach was highest in availability at the lowest modeled discharges. Modeled habitat accounted for about 24% of the HC Reach at a very low discharge of 5 kcfs and declined significantly to about 10% of the HC Reach at a discharge of 30 kcfs." (Page 2, Paragraph 6)

Response: The BLM does not completely agree with this finding. The assumptions used to develop this model are not substantiated with field research on redband trout in the Hells Canyon Reach. The radio-telemetry equipment was unable to track redband trout into deeper waters. Therefore, modeling assumptions about their behavior during some flow stages may not be correct.

14 "....the availability of bull trout habitat modeled in the HC Reach decreased steadily with increasing discharge and declined from 24% of the reach area at 5 kcfs to 6% of the reach area at 100 kcfs." (Page 2, Paragraph 6)

Response: The BLM does not agree with this finding. The assumptions used to develop this model are not substantiated with field research on bull trout in the Hells Canyon Reach. There was very little research conducted by the applicant that could be used to estimate the amount of habitat that would be provided for bull trout by the various flow scenarios. No research on population levels was conducted and their abundance remains unknown. Projecting the affects of flow on a population of bull trout that is virtually unknown in its habits or abundance may result in incorrect assumptions.

15. "Minimum flows associated with the fall chinook program are important for both redband and bull trout modeled habitat because they protect the range of discharges at which the habitat for these native salmonids is maximized and are influenced the most by load--following operations. Minimum flows from the fall chinook program provide this protection for about three-fourths of the modeled overwintering period for redband and bull trout in the HC Reach." (Page 2, Paragraph 6)

Response: The BLM does not agree with this statement. The fact that little is known about the overwintering habitat of bull trout and redband trout in the Hells Canyon Reach prevents confirmation of these assumptions. Protection offered for three-fourths of the overwintering period may not offset the adverse affects that could occur in the other one-fourth of the wintering period. The applicant should have conducted overwintering studies to verify the assumptions they have used in the model. The applicant clearly acknowledges that the radio-telemetry equipment could only penetrate the river to a limited depth. The applicant provides no information concerning the affect of flows on bull trout and redband trout throughout the rest of the year. It is known that both species are present in the river throughout the entire year. Their abundance and distribution is not adequately documented.

III. Study Adequacy

This study is not adequate because it does not clearly state the findings presented in the discussion as conclusions. The results of the study are stated in the discussion and the executive summary. A conclusion section is a standard for all scientific reports. The bull trout and redband portion of the study indicates that their overwintering habits in the Hells Canyon Reach of the Snake River are unknown. Unsubstantiated assumptions about bull trout and redband trout habitat utilization in the mainstem Snake River are used to model the affects of operational scenarios on these species.

IV. BLM Conclusions and Recommendations

Conclusions

The instream flow assessment represents an extensive modeling effort to show the affects of two flow scenarios on ten target species/life-stage. The modeling leads the BLM to believe that conclusions should be drawn that the white sturgeon population in the Hells Canyon Reach is not being adversely affected by proposed operations or RRFP scenarios. The instream flow projections modeled for white sturgeon habitat are supported by the Applicant's white sturgeon studies that document a general improving trend in age structure and population abundance.

The instream flow model can only be used to relate the relative impact of the two flow scenarios to each other. It should be acknowledged that this study is a state-of-the-art effort to simulate how the Hells Canyon Reach and the 10 fish species/life stages will be affected. However, the use of multiple models to simulate fish response and instream flows should not be considered to represent absolute (real) habitat quantities or qualities.

The modeling of fall chinook salmon indicates that the current protective flow measures provide near optimum habitat for this species from spawning through emergence. However, the water quality problems associated with the Hells Canyon Complex that cause the fall chinook fry to emerge from the gravel several weeks late is not discussed. The late emergence and subsequent late migration is known to adversely affect their survival. Therefore, the current protective flows that promote initial survival of juveniles may be of limited value unless water quality issues are resolved.

The redband trout and bull trout flow scenarios are based on numerous assumptions that are not fully supported by research. The applicant was not able to track these species in the deeper parts of the river. The model demonstrated that there are periods of habitat reduction that are of short duration. The applicant assumes that these short periods will not be harmful to bull trout and redband trout. These assumptions are not substantiated by the current research.

Bull trout are an ESA listed species. The relative abundance of the species in the Hells Canyon Reach is unknown. The movement and habits of this species in the Hells Canyon Reach are poorly understood. Although the applicant has documented bull trout movements from the Hells Canyon Reach into tributaries, the affects of instream flow operational scenarios on the species has not been studied in the field.

Recommendations

1. It is recommended that the applicant expand their study of bull trout and redband trout in the Hells Canyon Reach of the Snake River to verify the actual affects of instream flow assumptions presented in this modeling exercise. This would include modeling the habitat available throughout the spring, summer, and fall that is not covered by the current modeling.

2. The bull trout study should be expanded to document the relative population abundance in the Hells Canyon Reach and the preferred habitat use throughout the year.

3. The applicant must present their conclusions in a manner that clearly defines their position concerning affects of the flow scenarios on the ten target species/life stages modeled in this study. A discussion of the model findings is not adequate.