

**Cooper Lake Project Relicensing
Meeting Summary:
Instream Flow Review Team Meeting
October 12, 2004 — 8:30 A.M. to 2:30 P.M.
HDR Alaska, Inc., Conference Room
Anchorage, AK**

Meeting Attendance:

Name	Affiliation
Margaret Beilharz	U.S. Forest Service (USFS)
David Blanchet	USFS / Chugach National Forest
Phil Brna	U.S. Fish and Wildlife Service (USFS)
Karen Demsey	Long View Associates, Inc. (LVA)
Jason Kent	HDR Alaska, Inc. (HDR)
Joe Klein	ADFG
John Morsell	Northern Ecological Services / HDR
Sally Morsell	HDR
Larry Peltz	National Marine Fisheries Service (NMFS)
Rob Spangler	USFS
Burke Wick	Chugach Electric Association (Chugach)

by conference phone:

Chi-Ming Huang	R2 Resource Consultants (R2)
Dudley Reiser	R2

Opening / Overview of Objectives

Following introductions, Jason Kent (HDR) briefly reviewed the purpose and basic agenda for the meeting. He explained that the meeting was intended to be discussion-driven rather than presentation-driven, with the following two objectives:

- Reach agreement on use of the final habitat and temperature models.
- Discuss revisions to the draft Instream Flow Study report and address questions so the report can be finalized following receipt of review comments. Jason noted that the comments on the revised draft Instream Flow Study report (“Revised Draft report”) were due by November 10, with target for issuance of the final report on December 10. This schedule has since been modified to comments due by November 1, and target final report issuance on November 15.

Discussion of Habitat Model

Jason Kent briefly summarized the differences between the draft and final habitat models, noting that the memorandum issued the previous week (“Model Output Differences – Draft and Final Models,” dated October 6 [“Model Differences memo”]). He noted that

he had worked closely with R2 Resource Consultants (R2) to address R2's comments on the draft models. Changes made to the hydraulic model include parameters for channel geometry, discharge, water surface elevation, and assigned values for ungaged tributary flow. Jason stated that the result of the changes is a better calibrated model. Differences in output between the draft and final habitat models ranged from 1% to 56%, depending on the parameter and modeling scenario.

Dudley Reiser (R2) commented that he would like to see curves showing the relation between weighted usable area (WUA) vs. flow; the report jumps directly to presentation of time series, but omits this key intermediate step. Dudley stated that he needed to see the WUA vs. flow curves before he could confirm that the time-series analyses were valid, and that these definitely should be included in the report. Joe Klein (ADFG) agreed with Dudley, adding that the reviewer needs to be able to follow how the studies were done.

Jason Kent responded that he did have the WUA vs. flow curves but had decided not to include them in the Model Differences memo or revised draft Instream Flow Study report ("Revised Draft report"). Jason agreed to include these curves in the report and also indicated that he would email the curves to Dudley during a break in the meeting. Joe Klein further suggested that the WUA data be presented in both graphical and tabular format.

Jason Kent explained that the Model Differences memo was intended to describe in general terms how R2's review comments on the draft models had been addressed, and to report that all of R2's comments had indeed been addressed. Jason added, however, that he had not sent out a point-by-point response to the comments, because his intent had been to discuss the changes at this meeting. Dudley Reiser emphasized that the Instream Flow Review Team ("Review Team") needed to see the detailed responses and other supporting information in order to reach final consensus regarding adequacy of the model and confirm agreement with the conclusions in the study report.

Jason Kent pointed out that Chi-Ming Huang (R2) had been integral in bringing the habitat model to final form, and that all the information from Jason and Chi-Ming's work on revising the model was documented. Chi-Ming confirmed that he had documentation of all of the details of their work on the model revisions.

Jason Kent explained some of the details behind the calibration of the final hydraulic model, and noted that everything was described fully in the documentation of the calibration. Chi-Ming Huang added that this documentation also provides the rationale behind the assumptions used in the calibration. Margaret Beilharz (USFS) mentioned that she had received a copy of the documentation on calibration details but had not forwarded them. After further discussion, it was agreed that the calibration details for the hydraulic model would be included as an appendix to the Model Differences Memo. Margaret Beilharz and Dave Blanchet (USFS) asked Dudley Reiser to distribute the calibration details documentation to the Review Team. Later in the meeting, it was

decided that the distribution would be kept to only those few people on the Review Team who would be interested in receiving this information.

Phil Brna (USFWS) noted the absence in the Revised Draft report of a description of the hydrology of the flows for the five modeling scenarios. Joe Klein added that the hydrology description would help the reviewers understand how the scenarios fit into the natural flow regime. Jason Kent responded that a description of the hydrology could be developed and included in the report, but emphasized that the group should keep in mind the hydrology was only developed very generally for these hypothetical scenarios.

Phil Brna asked about development of more refined hydrologic scenarios for modeling. Jason responded that this was outside the scope of the Instream Flow Study per se; the objective of the study was to see how changes in flow and temperature in Cooper Creek could affect habitat suitability for different lifestages of the target species, and to provide an idea of potential benefits in terms of different scenarios — but not to try to develop scenarios to optimize those potential benefits. Burke Wick (Chugach) added that the “rounded number” scenarios were selected just to provide an idea of where more detailed modeling could be of interest.

Joe Klein noted that the Model Differences memo indicated that detailed survey data had only been collected during Trip 1, and he asked whether channel geometry might have changed between these two trips. Jason Kent replied that he did not believe there had been any significant change in channel geometry, based on field observations and transect depth measurements. Moreover, Jason pointed out, the channel geometry in the final hydraulic model was modified using differences found with depth measurements collected during Trip 5.

Joe Klein also asked Jason Kent to explain what source of information had been used to revise the hydraulic model. Jason replied that many of the changes were based on review of field notes. Chi-Ming Huang added that the final model used measured data whenever it was available, and nearby gage data rather than computed flows, and Joe Klein agreed that this was appropriate. There followed additional discussion regarding some of the detailed changes and rationale for determination of flows used to construct and calibrate the hydraulic model. Joe Klein stated that the model calibration was not as robust as it could be because it was based only on Trip 1 and Trip 5 flows; these were the second-highest and highest flows, respectively, that were surveyed. Chi-Ming agreed that it would have been better to have a wider range of data sets to work with, but explained that velocity sets had not been collected during Trips 2–4.

Jason Kent noted that he would be adding a Methods section to the report, which would explain the process and steps involved in the model development and calibration. Jason also confirmed that all details would be appended to the report.

Discussion of Temperature Model

At the beginning of this discussion, it was agreed that Dudley Reiser would distribute to the Review Team a report from Stuart Beck (R2) describing calibration of the final

SNTEMP model. Jason Kent requested that the Review Team read Stuart Beck's writeup on calibration of the SNTEMP model and provide any comments along with comments on the Revised Draft report.

Jason Kent explained some of the differences between the draft and final temperature models, as identified in the Model Differences memo. Types of changes included adjustments on input for relative humidity, stream geometry (to reflect the relation between top width and flow), topographic/vegetative shading, and Stetson Creek inflow; in addition, the calibration approach was modified, resulting in improved calibration of the model.

Jason Kent explained that the results using the final model predict slightly warmer temperatures at the confluence and slightly cooler temperatures at the mouth, relative to the results from the draft model. He stated that these modifications in the results do not change the analysis regarding results and implications of the various scenarios. Jason also noted that, for the purposes of having all of the instream flow modeling information in one document, the updated temperature results are presented in the Revised Draft report, instead of in an update of the February 2004 draft temperature modeling technical memorandum.

Dudley Reiser questioned having the temperature modeling results expressed in terms of average daily water temperatures. He stated that daily averages can miss important hourly maximums/minimums that drive fish populations. Dudley added that having a smaller time step can make a big difference in how the results are interpreted. Jason Kent responded that the smallest time step that can be evaluated with SNTEMP is daily, and added that early in the study planning process the Review Team agreed to the use of SNTEMP in the study, recognizing its limitations. Margaret Beilharz stated that, based on her understanding, streams in the region typically do not experience appreciable variation in temperature during the course of a day; the group indicated general agreement that this was indeed the case. Dave Blanchet suggested that existing hourly temperature data for Juneau and Crescent creeks (which also have lake inputs) could be used to evaluate the expected daily temperature fluctuations in Cooper Creek.

Jason Kent then presented graphs of temperatures predicted for the various scenarios, noting that the graphs were developed the day before so were not included in the Model Differences memo or the Revised Draft report. The graphs depict the simulated temperatures through the modeling period with an overlay showing the lifestage periodicity for the species of interest. The general consensus of the group was that these figures aid interpretation of the results and should be included in the final report.

The group discussed other graphics in the report, indicating which figures they found helpful and requesting clarification, additions, and changes for other figures. Larry Peltz (NOAA) requested that the temperature graphs also show the predicted period of emergence for chinook fry under the various modeling scenarios. Larry explained that it is important to make sure fry would hatch in the creek around the same time they would in a natural system. Jason agreed to display the range of hatching period for each species

on the graphs, and the group generally agreed with Jason's suggestion that the emergence timing be calculated based on the mid-point of the expected spawning period. John Morsell (Northern Ecological Services) cautioned the group that there is not necessarily a linear relationship between degree-days and hatching time, and also noted that fish are able to adapt to different temperature regimes. Larry Peltz responded that showing the expected ranges of fry emergence would nevertheless provide an indication as to whether the resulting temperature regime is in the right ballpark to accommodate the species' natural periodicity.

Noting that the models were constructed using only data from 2003, Phil Brna brought up the idea of somehow normalizing the data so that the results are based on more general temperature and stream flow trends. The group discussed the merits of this approach. Joe Klein suggested correlating the limited existing data to parameters that would allow extrapolation of the data over a longer time period. Sally Morsell (HDR) noted that she had tried to develop a correlation between stream temperature data collected at the upstream and downstream gages to extrapolate the data to a longer period of record, but that there were too many variables to draw any meaningful correlation. Phil Brna asked how confident the study team was that 2003 was reasonably representative of more general hydrologic and temperature patterns. Burke Wick noted the wide range in temperatures and precipitation over the last few years, and suggested that if 2003 was within the "normal" range of interannual variation, there was no obvious benefit in trying to extrapolate the data to longer-term trends. Dave Blanchet stated that 2003–2004 temperatures were exceedingly unusual, much higher than normal.

Margaret Beilharz asked whether different input parameters (e.g., lake temperature) could be run through the temperature model to see how much the results would be affected. Jason Kent replied that it was possible to do this kind of sensitivity analysis, using varying temperatures, streamflow, etc. Margaret suggested that the results of a sensitivity analysis could help evaluate how much variation could be expected in Cooper Creek temperatures on an interannual basis, and where the output based on 2003 conditions fits in. The group continued to discuss at length the topic of interannual variability and representativeness of the 2003-based modeling results. John Morsell commented that the group was making the exercise more complicated than it needed to be; i.e., the existing modeling results do clearly show that significant temperature changes in Cooper Creek are possible under various mitigation scenarios — which is the question that the modeling was intended to address.

Jason Kent stated that developing mathematical relationships to show in detail how the 2003–2004 period fits into longer-term hydrologic and temperature patterns would require a study effort on the scale of a masters thesis or dissertation. Jason suggested instead that precipitation/temperature records for 2003–2004 could be more qualitatively compared to historical data and labeled accordingly (e.g., "warmer, drier than average"). Sensitivity analysis could be used to determine implications for modeling results as a part of further study.

The discussion turned to how hydrologic and temperature variation would be expected to affect fish use of Cooper Creek. Phil Brna stated that general predictions can be made but it will basically come down to professional judgment. Phil added that variability would probably just mean that some years rainbow trout would spawn in the creek and some years they wouldn't, similar to all natural systems. Burke Wick noted that the common occurrence of avalanches in the Cooper Creek canyon is another significant variable from year to year. Burke explained that these avalanches have sometimes blocked part of the creek, and although the stream cuts through relatively quickly, large avalanche deposits can end up covering a stretch of creek for most of the summer. Burke stated that it seems this would affect habitat use during those periods.

Near the conclusion of this discussion, Jason Kent stated that he felt it would be a useful exercise to do a general census of Kenai Peninsula temperature and hydrologic data to put 2003–2004 conditions into context. He noted that there would not be whole new sets of modeling output or graphs to represent stream habitat scenarios under different climatic conditions. John Morsell reiterated that he felt the studies have produced sufficient information to allow speculation as to the potential effects on fish of different types of mitigation scenarios in Cooper Creek, and cautioned the group against losing sight of the forest for the trees.

Discussion of Model Interpretation and Synthesis Relative to Fish Populations

The discussion transitioned to the topic of how the modeling results might translate to predictions of fish use of Cooper Creek with the types of mitigation being considered. Phil Brna offered that the USFWS was uncomfortable making any predictions of numbers of fish in the creek. John Morsell responded that he had also been uncomfortable with this task at first, but explained that Chugach understandably wanted to know what the implications of various potential mitigation scenarios might be. Regarding the predicted fish numbers presented in the report, John Morsell agreed that the predictions are speculative but noted that he had put a good deal of analysis into the professional judgment that was the basis for these predictions.

Burke Wick stated that as part of the decision-making process Chugach needs to have at least an order-of-magnitude idea of the likely outcome of the potential mitigation measures being investigated. Burke added that he felt John Morsell had done a good job with the available information, and stated that the group now needed to decide whether they agree or disagree with John's conclusions — and if they disagree, explain why and offer suggestions as to where to go from here. Dave Blanchet stated that he agreed some kind of estimate of mitigation outcome in terms of fish use of Cooper Creek is needed, by the agency decision-makers as well as by Chugach. Phil Brna stated that it was important to recognize there is more to consider than just fish numbers — genetic diversity is also an important consideration. Joe Klein added that State laws emphasize protection of *habitat*.

Joe Klein suggested that the report include a brief explanation of the intended use of the modeling and fish number predictions; i.e., that the intent is to provide a general idea of the range of possibilities. Larry Peltz recommended that all caveats be clearly laid out at

the beginning of the report, to reduce the chance that outside parties would take any numbers out of context and represent them as absolutes.

John Morsell noted that one factor that makes it easier to come up with reasonably plausible fish number estimates is that Cooper Creek has a very limited stream length, meaning there are clear physical limitations on how many fish could be produced in this stream; another factor tending to limit production is the limited amount of quality fish habitat in the Canyon Reach of the creek.

Margaret Beilharz asked whether the WUA values should be interpreted as an index or as actual physical area on the ground. Jason answered that, as a rule, any model output should be approached as an index; that being said, the WUA values do provide an extremely approximated square footage of different types of habitat, which allows a look at where the biggest absolute effects of a scenario are going to be. Jason also pointed out that the vertical scales vary on Figures 3–72 of the Revised Draft report, so not all habitat increases shown on the graphs are going to be of equal importance. Burke Wick suggested that the concept of habitat availability and quality needed to be explained better in the report, instead of requiring the reader to look to results presented in other reports; for example, it is useful for the reviewer to understand that riffle-boulder habitat is not very good fish habitat, so increases in WUA for this habitat type may not be all that meaningful. Joe Klein agreed, and further suggested that the results for the area downstream of the Stetson Creek confluence should be broken out and presented separately by reach – i.e., Alluvial Reach and Canyon Reach — instead of lumping the results together.

Referring to page 26 in the revised draft report, Margaret Beilharz commented that it seemed the mitigation scenario being described did not exactly match any one of the five modeling scenarios. John Morsell explained that the scenario being described in this section encompasses the “MA [monthly average flow of Stetson Creek] in, 30 [cfs] out” scenario but is somewhat broader, recognizing that there could be adjustments to that general scenario. John also explained that because the temperature modeling indicated the “MA in, 30 out” scenario provided the greatest potential temperature changes in Cooper Creek, the estimates of the expected range in numbers of fish should be considered to represent the higher end of potential fish numbers.

Phil Brna asked why the modeling scenarios all assumed a minimum year-round release of 5 cfs from the dam. John Morsell replied that this specific flow amount is somewhat arbitrary, but it represents an estimate of a flow that would be sufficient to maintain some minimal water depth over incubating eggs through winter. Margaret Beilharz said it would be important to determine how much spawning area would be dewatered by dropping flows from 30 cfs to 5 cfs. Jason Kent stated that it would be possible to estimate this by calculating wetted perimeter for these two flows.

Margaret Beilharz commented that the fish analysis provides good information as a starting place for mitigation discussions. She added that the analysis in terms of effects on different species provided some good food for thought. Rob Spangler (USFS)

similarly commented that the scenarios and conclusions (with one exception) in the fish analysis part of the report are pretty realistic, and that this was the appropriate level of analysis.

Rob Spangler stated that he only took exception to the conclusions regarding Dolly Varden, and Phil Brna noted that Doug Palmer (USFWS) was of the same opinion. John Morsell agreed that there is uncertainty, but stated that based on his observations over the years, Dolly Varden are only present where other species are not; they do not seem to fare well in the presence of competition. Larry Peltz commented that he had noticed a similar association in Alaska streams: Dolly Varden are found in marginal habitats that other species cannot live in and only exist in large populations when there are no other species to compete with. Phil Brna stated that the DLA implied it is stream temperatures, not competition, that would limit Dolly Varden under the mitigation scenarios. Rob Spangler suggested that it would be helpful if John could cite supporting information to bolster his conclusions regarding Dolly Varden.

Rob Spangler stated again that he did not feel there was enough evidence to support the conclusion that the mitigation scenario would be detrimental to Dolly Varden in the creek; in fact, maybe it would benefit Dolly Varden. Rob pointed out that increased flow and temperature in the Stetson Reach would have the effect of making the reach more productive, thus lessening the need for fish to compete for food. Rob also stated that juvenile Dolly Varden are very difficult to count, so there may be more Dolly Varden present in reaches with other species than fish counts indicate. Burke Wick pointed out that the analysis is not intended to say Dolly Varden would be negatively impacted in this the mitigation scenario — just that it is something that needs to be taken into consideration. John Morsell noted that the analysis indicated the potential decline in Dolly Varden density only in the Stetson Reach; in the Canyon and Alluvial reaches, the conclusions were that existing Dolly Varden densities would likely be unchanged.

The group returned to the topic of refining the modeling scenarios. Margaret Beilharz asked whether the analysis section of the report would evolve if other, or more refined, scenarios were evaluated. Larry Peltz responded that this should depend on how the settlement negotiations proceed; if the parties end up agreeing that it is worth pursuing this kind of engineering mitigation, that would be the time to adjust the modeling scenarios.

Margaret asked whether the warming pond in Cooper Creek was a mitigation concept still being investigated. Burke Wick explained that this alternative had been dropped based on the preliminary analysis (presented in the August 2004 report, “Potential Cooper Creek Protection, Mitigation and Enhancement Measures”), which showed that this alternative would be very costly and provide only minimal temperature benefit. Joe Klein commented that the Revised Draft report did not consider the potential incremental benefits of other flow scenarios contemplated in the DLA — e.g., a “50 out” scenario. Jason Kent reminded Joe that the original temperature modeling technical memorandum (February 2004) did analyze the “50 out” scenario and that the results showed that there was little incremental increase in temperatures between the “30 out” and “50 out”

scenarios; this is why the subsequent modeling scenarios have focused on the 10 cfs and 30 cfs releases.

Phil Brna stated that the mention in the Revised Draft report of possible artificial introduction of fish into Cooper Creek to jump-start fish production would be a lightning rod for the fish agencies; he suggested omitting this from the final report because it would just raise a lot of unnecessary concern and there is no realistic chance that artificial introduction would ever get approved.

Margaret Beilharz suggested it might be worth running the mitigation scenarios through the operations model to evaluate the impact on generation. Burke Wick responded that Chugach has calculated this impact based on an average dollar value for lost generation water; in reality there are many variables affecting the value per kilowatt, but as a rule of thumb, each 1 cfs on an annual basis is equivalent to roughly 1% of the Project's annual generation. Burke also noted that some scenarios do not result in any lost generation, but all of the scenarios have significant operation and maintenance (O&M) costs. Margaret suggested that it would be useful to estimate the generation impact of the "MA in, 30 out" scenario, given that sometimes the monthly average flow from Stetson Creek is less than 30 cfs.

Dave Blanchet commented that cost of the mitigation alternatives was a troubling issue. Dave asked when the group would be discussing the "inflatable bladder" alternative, which seemed to be a less costly alternative. Burke Wick replied that this alternative could be discussed by the relicensing Settlement Working Group (SWG), but noted that Chugach no longer considered this a viable alternative because it does not provide much control over the amount of flow that goes into the creek. Burke stated that the seemingly most feasible options involve a tower in the reservoir that can draw water from two levels (to accommodate different reservoir levels); operation of the facility would be passive, but some source of electricity would be required to operate the flow release valves. Burke also noted that there would need to be some way to keep the structure heated enough to keep it from freezing up. Burke explained that the biggest cost in these scenarios is for the Stetson Creek diversion, which is necessary in order to achieve enough warming in Cooper Creek; the diversion needs to extend far enough upstream of the dam to keep the cold water from cooling the water near the dam. Burke added that the costs of potential mitigation measures would be discussed in the SWG, as would the definition of success.

Rob Spangler reiterated that "success" did not simply mean numbers of fish; other factors, including genetic diversity, are also important. Burke Wick agreed, but stated that at the same time, there would also need to be a larger fisheries management strategy in place that would protect any genetic diversity that could be gained by additional fish production in Cooper Creek — for example, to ensure that the returning fish would not all be caught in the lower Kenai River. Phil Brna emphasized that the USFWS does not define success in terms of numbers of fish. Burke noted that to other parties, however, increasing the level of fish production in Cooper Creek is the most important objective. Burke added that the parties will also have to decide whether the increase in genetic

diversity would be significant enough to justify spending mitigation money on the engineering measures in Cooper Creek vs. doing something else potentially more effective, such as off-site mitigation that could benefit Kenai River fisheries.

The group discussed the concept of off-site mitigation, and agreed that if this were to be pursued it would be up to a fisheries Technical Working Group to develop a list of potential options.

Report Revisions

At various times during the meeting, the group discussed revisions that would be made to the Instream Flow Study report. It was generally agreed that the final report should be a stand-alone document. Specific additions to the report that were suggested included the following:

- Table of contents
- Maps and photographs
- Label on map to show location of impassable falls at the upper end of the Stetson Reach
- Explanation in the Introduction as to why the study focused on these particular fish species (e.g., no sockeye because impassable falls preclude access to the lake)¹
- Methods section with details of modeling process
- Clarification of model and analysis assumptions
- Presentation of results by reach
- WUA vs. flow curves
- Graphics depicting relative amounts of habitat types within each reach
- Other additions/modifications to graphics (e.g., depiction of fry emergence timing on temperature time series)

The group also agreed that the report should include a 2–3 page executive summary that decision makers would be more likely to read and get something out of. It was first suggested that the executive summary be written with an eye to delivering the message that the results of this study provide an idea of the potential for significantly affecting fish habitat in the creek and what types of mitigation scenarios should be the focus of further investigation. After further discussion, however, it was agreed that the executive summary should be as neutral as possible, and therefore should only discuss the study results, without discussion of the conclusions.

Report Review and Distribution of Pending Information

Margaret Beilharz, Dave Blanchet, and Dudley Reiser indicated that R2 would provide written comments on the revised draft report. Rob Spangler stated that he did not intend to review or comment on the details of the hydraulic model but that he would like to know what assumptions were made, how decisions were made, etc. Margaret Beilharz

¹ John Morsell noted that he conducted a foot survey of Cooper Creek three weeks prior to this meeting and observed over 200 sockeye spawning in the Alluvial Reach, up to the lower end of the Canyon Reach. He noted that this is very different from any observations made during the previous two falls.

asked Jason if he could provide more information on the model to assist the Review Team in their review. Jason pointed out that the Review Team would have all the information that had been requested once R2 sends out the calibration documentation. Jason also indicated he would send out a spreadsheet that contains all of the calculations made on the habitat model.

Closing

The meeting adjourned at approximately 2:30 P.M.