

**Cooper Creek Habitat Model Review
R2 Resource Consultants**

Cooper Creek Time Series Review Summary								
Phase	Item	Features	Relevance	How to Resolve	Affected Sites	Affected Habitats	HDR/Chugach Response	Adjustment to Model
Habitat Modeling	1	The most upstream transect of each site was dropped out of WUA calculation by assigning zero transect weighting.	WUA won't reflect the actual site habitat characteristics without including all transects.	Assign appropriate transect weighting to include all transects in WUA calculation. Attached Figure 1 to Figure 3 showed the differences in site-composite WUA curves using two types of transect weightings.	all sites (except Site C)	all habitats	We agree that it is important to include the upstream-most cross-section in the analysis. Because all cross-sections in a study site were set at similar and contiguous habitat types, setting the weighting factor to model a "break point" halfway between the cross-sections is appropriate.	All reach weighting factors were changed to 0.5.
	2	Study sites having the same habitat type were assigned the same weighting, irregardless of the actual representative length of each site. For example, Site G had a stream length of 63.3ft and Site J of 154ft, and the WUA of these two sites were added together to represent Riffle-Cobble habitat downstream of Stetson Creek without considering the actual stream length each site represented.	The composite WUA may not truthfully reflect the actual habitat vs. flow relationship. Also this would become a source of error in time series analysis, unless this equal transect weighting assignment was an agreement among all parties.	Assign appropriate weighting to each site by including the actual stream length each site represented.	G, J, K, L, H, and I	Riffle-Cobble, Riffle-Cobble with side channel, Pool-Main Channel Scour	We agree with this assessment. Habitat weighting by reach length was utilized in the reach-level WUA analyses.	The changes were made in the model post-processing.
	3	The WUA's of two sites having the same habitat type were ADDED together to represent the WUA of that habitat type. For example, the WUA's of Site G and Site J were ADDED together to represent the WUA of Riffle-Cobble habitat below the confluence.	The resulting WUA was double of the actual value, because the two WUA's should be averaged. Also the habitat values in time series were doubled.	Use average of the two WUA's, if equal weighting to each site is assigned.	G, J, K, L, H, and I	Riffle-Cobble, Riffle-Cobble with side channel, Pool-Main Channel Scour	In the final habitat model post processing, the WUA values were averaged using the weighting factors described in item #2.	The changes were made in the model post-processing.
Time Series Analysis	4	Site C and Site D were assigned the same WUA curves in time series calculation.	The calculated time series for Glide habitat that includes Site D was incorrect.	Use correct WUA curve for Site D in time series calculation.	D	Glide	This problem was corrected in the final habitat model time series analysis.	The changes were made in the model post-processing.
	5	Rainbow trout's WUA curves of all 4 life stages used in time series analysis were incorrect	Resulting in incorrect time series for rainbow trout.	Use the correct rainbow trout WUA in the time series analysis.	J	Riffle-Cobble	This problem was corrected in the final habitat model time series analysis.	The changes were made in the model post-processing.
	6	Coho's total habitat area in WUA curves used for time series analysis was incorrect.	Incorrect time series analysis for coho's total habitat area.	Use the correct coho's total habitat areas in the WUA curve for time series analysis.	C	Riffle-Boulder	This problem was corrected in the final habitat model time series analysis.	The changes were made in the model post-processing.
	7	Some simulation flows were removed from WUA-Q curves, resulting in a simplified WUA relationship with coarser resolution in flows.	More simulation flows can better define the relationship between WUA and flows, which can lead to more accurate time series analysis results. The flow removal might result in a shift in optimal flow on WUA-Q curve.	Keep and use all simulation flows in the WUA-Q relationship for time series analysis.	A, G, H, I, J, K, and L	Riffle-Cobble, Riffle-Cobble with side channel, Pool-Main Channel Scour	We agree that a finer resolution will result in more accurate analysis. The final habitat model included as many as 30 simulation discharges (the maximum allowed in PHABSIM). All simulation flows were kept in the final habitat model post-processing.	The changes were made in the model post-processing.
	8	The algorithm employed by HDR for deriving habitat values from WUA curve will introduce errors in the time series. The streamflow was rounded to the nearest lower simulation flow for which WUA was calculated in the PHABSIM habitat model. For example, chinook spawning (existing condition) at Q=49.9 cfs has WUA=17,892 ft ² by interpolation, while HDR's algorithm would give WUA=16,363 ft ² (this is WUA for Q=45.0 cfs). As a result, there is an 8.5% difference in time series.	The habitat values derived from WUA curves may include significant errors, affecting the credibility of time series analysis results.	Use linear interpolation, instead of lookup table, to obtain habitat values from WUA-Q curve. Attached Figure 4 and Figure 5 showed the differences in time series results for using two types of calculation algorithms.	all sites	all habitats	Linear interpolation might increase the accuracy of the habitat analysis. As described in item #7, up to 30 simulation discharges were modeled for each study reach. For the weekly average flows that fell between the simulation discharges, WUA values were linearly interpolated.	The changes were made in the model post-processing.
	9	The weekly flows at the Cooper Creek mouth were different from the discharges calculated using the flow data at the USGS gage (#1526100). The difference only occurred between Week 18 and Week 26, with the maximum difference of 15% (USGS=56.6cfs, HDR=48cfs) at Week 24 (10/19/04 to 10/25/04).	The difference in flows will affect the accuracy of time series and the decision made using the time series analysis result.	Use weekly streamflows calculated from USGS data, or provide justification for using flows different from USGS data.	G, H, I, J, K, and L	Riffle-Cobble, Riffle-Cobble with side channel, Pool-Main channel Scour	This applies to measured flows only. The final existing conditions habitat model was re-run with the weekly flows based on USGS-reduced daily average flows, replacing the raw 15-minute gage data that were used for weeks 18-26 and likely caused the deviation.	The changes were made in the model post-processing.

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<p>Figure 1: Study Site A - Chinook Spawning</p>	<p>HDR TR (transect) Weighting TR1: All length between TR1 and TR2 TR2: All length between TR2 and TR3 TR3: All length between TR3 and TR4 TR4: All length between TR4 and TR5 TR5: was dropped out of WUA calculation</p> <p>Revised TR Weighting TR1: from TR1 to mid point between TR1 and TR2 TR2: from mid point between TR1 and TR2 to mid point between TR2 and TR3 TR3: from mid point between TR2 and TR3 to mid point between TR3 and TR4 TR4: from mid point between TR3 and TR4 to mid point between TR4 and TR5 TR5: from mid point between TR4 and TR5 to TR5</p>
<p>Figure 2: Study Site B - Chinook Spawning</p>	<p>HDR TR Weighting TR1: All length between TR1 and TR2 TR2: All length between TR2 and TR3 TR3: All length between TR3 and TR4 TR4: All length between TR4 and TR5 TR5: was dropped out of WUA calculation</p> <p>Revised TR Weighting TR1: from TR1 to mid point between TR1 and TR2 TR2: from mid point between TR1 and TR2 to mid point between TR2 and TR3 TR3: from mid point between TR2 and TR3 to mid point between TR3 and TR4 TR4: from mid point between TR3 and TR4 to mid point between TR4 and TR5 TR5: from mid point between TR4 and TR5 to TR5</p>
<p>Figure 3: Study Site J - Chinook Fry</p>	<p>HDR TR Weighting TR1: All length between TR1 and TR2 TR2: All length between TR2 and TR3 TR3: was dropped out of WUA calculation</p> <p>Revised TR Weighting TR1: from TR1 to mid point between TR1 and TR2 TR2: from mid point between TR1 and TR2 to mid point between TR2 and TR3 TR3: from mid point between TR2 and TR3 to TR3</p>
<p>Figure 4: Comparison of Time Series, Chinook Fry, Site A</p>	<p>Figure 5: Comparison of Time Series, Chinook Fry, Site F</p>
<p>HDR algorithm: with removal of some simulation flows in WUA curves and rounding down streamflow to the next lower simulation flow. Revised algorithm: Keep all simulation flows in WUA curves and use linear interpolation to calculate WUA.</p>	