CDOW Review Comments for Colorado River Water Availability Study – Phase I Report

1. Five (5) qualitative future climate scenarios (hot and dry, hot and wet, warm and dry, warm and wet, and median) were utilized as the basis for the climate change analysis of future projections of water availability in the Colorado River for 2040 and 2070. It is not entirely clear how these scenarios were derived, what they represent in terms of degree changes in temperature or % changes in precipitation, and how they relate to the specific findings in the 2008 report "Climate Change in Colorado – A Synthesis to Support Water Resources Management and Adaptation". Further, the majority of recent reports on the projected future climate of the West and Rocky Mountain Region seem to indicate hotter and drier conditions. Recent scientific reports also indicate that temperatures for the years of 2000-2009 are some of the hottest temperatures on record. Given these observations, we recommend that some mention and recognition be given to characterizing the observed climate in the Colorado River basin since 1950, and articulating more clearly what each of the 5 scenarios mean in terms of quantified change in temperature and quantified change in amount or form of precipitation.

2. The Phase 1 report indicates that each of the 5 future climate scenarios has an equal probability or chance of occurrence and cover a significant range of what could potentially happen of the available 112 GCM projections. From our perspective, the report would have greater value and usefulness if the authors will narrow the range of possible outcomes of future water availability by identifying which of the 5 scenarios are most likely to occur and which are not by 2040 and 2070 within the upper Colorado River basin, and highlight the specific water availability findings of each scenario.

3. It was difficult to differentiate between the "compact effects" and the "non-compact effects" of the study. We recommend that a clarifying statement or description be included in the executive summary and narrative portions of the report to articulate better what is the volume of water available under non-compact vs. compact conditions, or refer to where this specific information can be found if it is not to be included as an integral portion of the Phase I report.

4. The Phase I report includes findings for consumptive use and total water demand, yet it does not specifically break out or quantify the difference between consumptive needs, non-consumptive needs, and total water needs. For example, there is no discussion provided on what the projected impacts are to future in-stream flows (non-consumptive use) and how they might be impacted under the various qualitative climate change scenarios mentioned in Item 1 above. We recommend that greater attention be given to clarifying these findings so that future decision and policy makers can better understand the implications to each within the Colorado River basin. Quantification of projected impacts to in-stream flows will provide valuable information toward the protection of not only species of greatest conservation need, but also important sport fish and game species and the riparian habitats upon which they depend.

5. Evaluation of the Phase I report as it relates to how we view the issue of future water availability in the upper Colorado River basin and the various issues we are currently focusing on has prompted the question, "Is there anything the authors need to do differently for the Phase II report of the study?"

From a state fish and wildlife perspective, additional information that would really be of value to us is quantifying the magnitude and frequency of drop and/or fluctuation in water levels in the reservoirs, tributaries, and mainstem of the Colorado River throughout a 12-month cycle for the years 2040 and 2070, and a comparison of these results to the conditions that have been experienced for the period 1950-2005.

6. The Phase I study incorporates the use of tree rings and paleo-hydrology to capture the effect of historic wet/dry cycles as the GCM's apparently don't do a good job of this … It is unclear whether the current analysis provides an indication of how the magnitude, extent, and frequency of dry cycles are expected to change by 2040 and 2070 coupled with earlier and faster snowmelt runoff and their resulting impacts on water availability particularly in mid-late summer. If this information is not already captured in the Phase I report, we recommend this information be incorporated into Phase II of the study along with a quantification of how these dry cycles have changed (increased, decreased, remained same in intensity) and the resulting impact on future water availability within the upper Colorado River basin. (It is important to note that we are already experiencing a shift toward earlier (2-4 weeks) and more rapid snowmelt due to higher than normal temperatures and dust on snow … if this trend continues, how much more pronounced will these impacts be to future water availability by the years 2040 and 2070?)

7. Table 2 lists primary Phase I findings for winter and summer precipitation based on 2040 climate projections. If not already specified, we recommend the authors quantify and describe the net outcome of the changes in winter vs summer precipitation, the volume or percentage of water that may no longer be available for future use due to precipitation falling as rain rather than snow, and the management implications for future storage and capture of this water supply during times when the growing season has not yet begun.

8. Table 2 briefly describes the affect of elevation on modeled streamflow and water available to meet future demands based on 2040 climate projections. If not already provided, we recommend the authors provide a discussion and diagrams to show how the hydrographs for upper, mid, and lower reaches of the upper Colorado River basin are expected to change; and quantify the elevation zones for which significant changes are expected. As an example, the 2008 CWCB report "Climate Change in Colorado – A Synthesis to Support Water Resources Management and Adaptation" indicates significant change in snowfall at elevations below 8200 feet and a minor decrease in snowfall at elevations above 8200 feet. How do this finding correlate with the results in the Phase I report? Based on the expected changes in hydrographs for the upper, mid, and lower reaches of the Upper Colorado River basin, what does this tell us about future water availability within these various portions of the watershed and the implications for future management of rain/snow water supplies?