Environmental Stewardship
A Sustainable Ecosphere

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RE: Draft Instream Flow Guidelines

Dear Management Team and Study Team:

It is very encouraging to see solid scientific evaluation of the ecology of the lower Colorado River coming out of this project. This study combined with the Mosier & Ray (1992) study provide a solid basis for establishing an instream flow regime for the lower Colorado River that, to the extent that instream flow contribute to ecological health, protects the resource and provides an "ecologically sound environment". <u>Overall, Environmental Stewardship supports the instream flow regimes that are being recommended in this draft report but suggest that some adjustments are needed to ensure that the flow recommendations are as protective as those currently approved by the TCEQ.</u> It appears that the recommendations are based on sound ecological evaluation of the flow characteristics and biological requirements of the basin though the "flow calculation tool" seems to give results that are inconsistent with other aspects of the study. We look forward to reviewing the final report later this summer. To strengthen the recommendations we offer the following comments:

1. **"Natural" conditions** – Though the most recent major alteration with respect to flow regime of the lower Colorado River was the completion of Buchanan and Mansfield Dams, the urbanization, clearing, wood-cutting, and agricultural practices of the previous century likewise brought major alterations to the flow and ecology of the river. Though we understand the necessity of using a time period for which suitable data are available to fit the models and to be in agreement with current practices, it would seem more accurate to use a term other than "natural" to characterize this period since the pre-impoundment conditions were very different than those described by early explorers of this river basin (see attachment for descriptive account from early explorers and Mosier & Ray (1992) for a more in-depth account of the history of the river). <u>We would recommend associating the term "Pre-Highland Lakes" with a term such as "transitional".</u> Odum and Barrett (2005) include "domestic" or "human-designed and managed" as ecosystem types that are descriptive of the post-Highland Lakes conditions. <u>Perhaps the Team can 1) find a term that bridges this gap</u>

and that is more informative to the public and 2) provide more descriptive information in sections 2.2 and 3.1.1 to inform and clarify regarding the historical "natural" condition of the river and region.

The Monthly Flow Alterations graphs (2) on page 9 and the Habitat Duration graphs (3) on pages 49-50 clearly depict the "human-designed and managed" impacts on the lower Colorado River hydraulics (which are evidenced in the biology and water quality of the ecosystem). Shifting the Monthly Flow Alteration graph to show November – October on the x-axis would more clearly depict the two cross-over points where the managed system shifts from "under-watered" during the fall and winter months to "over-watered" during the irrigation season. These graphs also clearly depict the magnitude of the challenge we face if we are to bring "beneficial" uses in balance with "ecologically sound environmental" conditions in the lower Colorado River.

The Habitat Duration graphs clearly show how the character of the river has been altered during the current post-impoundment period. With a significant loss of shallow pools, edge, backwater and riffles during the irrigation season, along with an increase in rapids, the ecological and aesthetic nature of the river changes considerably.

2. Dissolved Oxygen Standard (5.0 mg/l vs. 6.0 mg/l) – Why was the DO criteria of 5.0 mg/l used throughout the river basin when Sections 1428 and 1434 (unique blue sucker habitat per Mosier & Ray) are designated for aquatic life use subcategory "Exceptional" with dissolved oxygen criterion of 6.0 mg/L. Would this make a difference in the subsistence flow recommendations for the Austin and Bastrop reaches? As discussed on page 53, "water quality exceedences are to be avoided" favoring a higher flow regime for the summer months. We would like to see subsistence flow recommendations based on the 6.0 mg/l Dissolved Oxygen criterion that is the regulatory standard for those segments of the river.

Likewise, the 6.0 mg/l DO standard should be applied in the water quality modeling in section 3.4. Under current regulatory standards, the results characterized in the last paragraph of p 36 and the statement on p 37 – "However, even under these extreme conditions, LSWP water quality monitoring predicts average and diel DO concentrations in the river will be *acceptable [under the 5.0 mg/l DO standard]* to meet the needs of the lower Colorado River aquatic community" – may not be supported for Sections 1428 and 1434 of the river [*emphasis added*].

3. Subsistence Flow Recommendations – It would appear that the subsistence flow recommendations are not as protective as the LCRA WMP. Mosier & Ray (p 47) determined that a critical flow of 500 cfs at Bastrop should be maintained from early March through May for successful spawning of the blue sucker. From the Percent of Maximum Habitat versus Simulated Discharge graph (Figure C6) it appears that 500 cfs flow provides ~100% of the spawning blue sucker habitat. To be equally as protective, the flow at Bastrop would need to provide the same percent of habitat as that provided by the Mosier & Ray study. Though it is difficult to interpolate with accuracy, using Figure C6 it would appear that the March, April, and May subsistence flow recommendations of 265, 178, and 266 would give habitat availability of ~90%, 80%, and 90% respectively (less protective). From Figure 4.6 these habitat availabilities would appear to correspond to exceedence levels of 60%, 80%, and 60% respectively. Somehow the "flow calculation tool" does not seem to give the same results as the habitat simulation studies. It appears that Mosier & Ray fortuitously recommended exactly the critical flow rate of 500 cfs that this study has estimated provides the maximum amount of habitat available at the Bastrop sampling site.

Mosier & Ray (p 37) confirmed earlier TPWD reports regarding the abundance of blue sucker in the segment from Utley to Bastrop and suggested that, "given the status of the blue sucker throughout most of its natural range, protection of this population should be a high priority". Mosier & Ray (p 39) found that the Eagle Lake study reach (corresponding to the Altair study site in the Columbus reach of this study) provided significant spawning habitat for the blue sucker. In their schedule of recommended flow (p 3) they superseded target flows in the Eagle Lake segment (Columbus Reach) with critical flows of 500 cfs for the months of March and April to meet blue sucker spawning requirements (May flow was 820 cfs exceeding the critical flow recommendation). <u>To provide instream flows no less protective than those included in the LCRA WMP the flows for the Bastrop and Columbus segments need to be adjusted to provide the same quantity and quality of habitat for spawning blue sucker.</u>

<u>Likewise, the subsistence flow recommendations for August and September should be adjusted to give the same habitat availability as provided by 120 cfs</u>, which appears to be about 70% from Figure C6 which corresponds to an exceedence level of ~85%.

Why was the Austin gage used for all low flow calculations (Table 4.7 p 58)? It seems more reasonable to use local gage data for these calculations. If it is not possible to use the local gages, it would seem reasonable to use an intermediate between the Austin and Columbus gages based on river miles from each gage. Mosier and Ray (p 25) provide a longitudinal profile of the Colorado River which gives a slope = 0.00026 between the Austin and Columbus gages which would likely be useful in making this interpolation.

<u>Environmental Stewardship favorably notes that the resulting monthly flow recommendations are "instantaneous minimums" and not daily averages.</u>

4. Base Flow Recommendations – The addition of DRY and AVERAGE base flow conditions is meaningful from both an environmental and flow regime management perspective for this region of Texas. It should fit well with the LCRA's Water Management Plan approach and provides for a more flexible range of operations. <u>The 60% and 80% habitat exceedence limits need to be adjusted vis-à-vis the subsistence flow recommendations to be as protective as the current LCRA WMP.</u>

To extend the logic from the subsistence flow recommendations to provide protection of the blue sucker habitat suggests that the spawning blue sucker habitat at the Utley and Altair sites be used to set the regime characteristics vis-à-vis the Bastrop and Columbus control points. For example the DRY base flow should improve on the maximum spawning blue sucker habitat at Utley by increasing percent habitat available from the ~ 90% that would be available at subsistence flow to 95-100% from Figure 4.6. Likewise, the Altair habitat should target 100% spawning blue sucker habitat which occurs at ~750 cfs (Figure C16). <u>The AVERAGE base flow should seek to ***optimize*** the habitat available at all blue sucker spawning sites in the spring months of March, April and May.</u>

5. Riparian Habitat – The study team is on target with their comments in section 3.2.2. regarding the impacts of irrigation releases and land use practices on the lower Colorado River. A return to pre-Highland Dam flow regimes for subsistence and base flow conditions, along with favorable land management practices, would encourage restoration of the riparian habitats within the main channel of the lower Colorado River bringing restored ecological function along with restored ecological service ("stabilizing") benefits. <u>We strongly encourage the adoption of a flow regime that encourages restoration of the riparian habitats</u>.

6. Sedimentation – Sedimentation is likely the single most deleterious impact of irrigation flow and land use practices on the lower Colorado River. The impact of sedimentation is evident on an ecological basis as described in section 3.3.2 (and elsewhere in the report) and on an aesthetic basis as experienced by those who fish, swim, and boat the river. Those who are familiar with the river know that water clarity (turbidity as measured by a transparency tube) decreases with the irrigation flows, and increases as flow levels subside, and improve dramatically as daily pulse flows due to hydroelectric generation subside. Local water quality monitoring in the Bastrop reach has detected water clarity to be in the range of 1-3 meters during moderate- to low-flow conditions.

The many benefits that might likely result from reducing the impact of sediment transport are clearly enumerated in the first paragraph on page 32. From an ecological perspective the more notable benefits would be the more gradually sloping banks and bars with increased emergent and herbaceous riparian vegetation, and aquatic habitat for marcroinvertebrates and fish. Likewise, as water quality increases (turbidity decreases) the growth of submerged vegetation would improve providing more cover and forage for sport fish.

From an aesthetic perspective, improved riparian habitat and gentler banks along with clear, clean water that is visibly inviting for fishing, swimming, and boating would increase the attractiveness of the river for nature tourism.

7. Habitat duration curves – What is the statistical variability of the data presented in Table 4.6? More specifically, what is the range for the 95% exceedence levels for adult blue sucker spawning habitat at Austin, Bastrop and Smithville? Is 95% protective enough vis-à-vis the statistical variability?

8. Blue sucker stock – What is the condition of the blue sucker population in the river? Is there a healthy mix of age groups from very young to old that would indicate that there has been reproductive success in the river over the period since the LCRA WMP instream flow regime has been in place? Since blue suckers live from 9-30 years and the LCRA WMP instream flow regime became effective with the 1997 revisions that were approved by TCEQ in 1999, the instream flow regime has only been in effect for about 8 years. <u>Did the blue sucker population sampled in this study show signs of improved reproductive success in these eight years of operations?</u>

9. Matagorda Bay Freshwater Inflow – As discussed in section 7.2, an important next step is to link this study with the inflow needs of the bay. In addition to the LSWP Matagorda Bay Health Evaluation (MBHE) study, it would appear prudent to also consider the results of the 2006 Matagorda Bay

Freshwater Inflow Needs Study conducted jointly by the LCRA, TCEQ, TPWD and TWDB (unless those two studies are reconciled in the MBHE study).

Environmental Stewardship is a nonprofit whose purposes is to protect, conserve, restore, and enhance the earth's natural resources to meet current and future needs of the environment and humans; to gather and use scientific information to restore and sustain ecological services provided by environmental systems; and to provide environmental education and outreach in order to inform the public of mankind's stewardship responsibility.

Thank you for the opportunity to review and comment on this report.

Sincerely,
Environmental Stewardship

Steve Box
Executive Director

References:
Odum, Eugene P., and Gary W. Barrett. 2005. Fundamentals of Ecology (fifth edition). Thompson Brooks/Cole, Belmont, CA.

Mosier, D. T., and R.T. Ray. 1992. Instream flow for the lower Colorado River: reconciling beneficial uses with the ecological requirements of the native aquatic community. Lower Colorado River Authority.

Early descriptions of the lower Colorado River basin

When the Spanish explorers arrived in Central Texas in the late 1600's they found a huge, almost impenetrable Post Oak Savannah wilderness teeming with bears, coyotes, deer and bison which they called the Monte Grande – or "Big Thicket". The Colorado River, almost a mile wide with sand banks and abundant in mussel shells, had water which was "the best we have found". The river was guarded on both sides by luxuriant trees – nut trees, ash trees, poplars, elms, willows, mulberries and wild grapevines much taller and thicker than in their homeland of Castile (Spain). The unending forest of pine, live-oak and oak were so tall and thick that in some places it was difficult to see the sky. Springs were abundant and prolific providing clean, clear, pure water to streams and rivers from the abundant and huge aquifers that lay beneath the ground. Now, after two centuries of urban development, clearing, wood-cutting and agriculture practice, the mighty wilderness is gone, leaving only isolated fragments of what once was (1,2). The springs are dry or dying and the land has become hard with less than half the organic matter that made it a sponge for catching and holding the water which fell on the once lush land. Now the water is "shed" to get it off the land, carrying much of our precious life giving topsoil along with it. Only a small fraction of the rain which falls is caught by vegetation and wicked into the ground to recharge the aquifers and drive the water cycles that are so important to the health of our land, rivers, and streams. The mussels are gone, as are the bison, the bears, the wolves, and many other native wildlife species that once enriched the region and fed the people.

As we walk into the 21st century we find that the population of Texas is expected to more than double by the year 2060 and the human demand for water expected to increase by 27 percent while water supplies are projected to decrease about 18 percent due to the accumulation of sediments in reservoirs and the depletion of aquifers leaving Texans almost 3 trillion gallons short of estimated human water demands if nothing is done to change our wasteful use and consumption patterns. Without changes in our water management practices about 85 percent of the state's projected population will not have enough water by 2060 (3).

As population growth continues to rise in Travis County and marches into Bastrop County we are expected to see the population increase by 1.4 million people by 2060 and the human water demand to increase by 107 billion gallons. Add to this the environmental need for water that is estimated to be an additional 1 trillion gallons over what is currently allocated, and we are 1.107 trillion gallons short (3).

Over the last two centuries we have severely damaged the ecosystem's water cycle, though we don't know to what extent. We do know that the springs which once flowed plentiful are drying up and the land no longer catches and holds the rainfall that is provided.

A goal of Environmental Stewardship is to advocate for protecting, conserving , restoring and enhancing the ecological functions of the river and its associated groundwater and watershed in order to optimize water available for beneficial human and environmental uses throughout the basin; to gather and use scientific information to advocate for restoring and sustaining ecological services provided by environmental systems; and to provide environmental education and outreach to the public regarding the challenges that face the region and available solutions to those challenges.

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1. "The Overlooked Estrada: The Espinosa-Olivares-Aguirre Expedition of 1709" by Anibal Gonzales. *Sayersville Historical Association Bulletin*, Number 2 Fall 1982.
2. "El Monte Grande, Texas Inner Frontier: 1691-1795" by Anibal Gonzalez, *Sayersville Historical Association Bulletin*, Number 4 Fall 1984
3. Statistics taken and calculated from 2007 State Water Plan, Texas Water Development Board